RAILROAD GAZETTE

FRIDAY, NOVEMBER 19, 1897.

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Contributions.

The Life and Cost of Maintenance of Steel Cars.

PITTSBURGH, Nov. 13, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your editorial article on the coming of the steel car you say that it is probable that the steel car will cost less for maintenance than the wooden car and that it is probable that it will have a life of 50 years under normal conditions. I think that you would have been safe in saying that it is certain that a well designed and well built steel car will have a life of 50 years, or even more, and that the cost of maintenance will be very much less than that of the wooden car.

My reason for believing that steel cars will do away almost entirely with the present continuous and ruinous expense account for maintenance is based upon the fact that these cars are so built that any ordinary concussion such as would injuriously affect a wooden car would not affect this in the slightest degree. For example, in the draft-rigging of a wooden car, ordinarily, the cheek plates, against which the follower plates are butted, are held in position by three ¾-in. bolts through wooden sills, the holes being sufficiently large, both in the casting and in the wood, to allow the bolt to pass through freely. In our construction the cheek plates doing similar work are riveted to the metal sills with twelve ¾-in. rivets, hydraulic, driven through reamed holes. It is obvious that a blow sufficient to destroy the former would not affect the latter construction at all. This feature is carried out throughout the entire structure. The sides of the steel car, as we construct them, become a girder some 6 ft. deep, a feature not practicable in wooden construction.

With regard to the life of the car, I ask your attention to the experience in Europe, and especially to the report of Mr. Tomler, of the Eastern Railroad of France. Mr. E. M. Herr, of the Northern Pacific Railroad, in a paper read before the Western Railway Club, at its September meeting of last year, quoted from Mr. Tomler as follows: "His investigation shows that cars built in 1869 have lost, by corrosion, but 6 per cent.; in 1874, 4 per cent.; in 1875, $3\frac{18}{100}$ per cent. The result of this investigation was a recommendation to paint all underframes every three years, cleaning away all rust and dirt and giving them two coats of paint. For frames so treated he estimates a life of from 50 to 60 years for the tender frames." CHAS. T. SCHOEN.

The New Chief of the Coast Survey.

ST. LOUIS, Nov. 10, 1897.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I know you will be glad to have me write to you in the matter of Professor Prichett's appointment as Chief of the Coast Survey. I was very much surprised to see the article in last week's paper on this subject and at once realized that you had never met Professor Pritchett, and had been misinformed both as to his abilities and his interest in this work.

The statement which cut his friends most was a statement that a boom had been organized in his behalf. I can positively assure you that this was not the case. How his name was first mentioned I am unable to say, but I am able to give you personally these facts. . . . This is a complete answer to the boom, and I feel pretty sure that there was very little log rolling connected with it.

Professor Prichett is in every way a scholar and has made the statement since the appointment that if he could be assured $3,000 a year and a good telescope, he would never desire to leave St. Louis.

Replying to your statement that there were a number of people in service who could have been promoted to this position, I think it has come to be understood that this force was very much cut up into factions, and to make an appointment from one of these factions would probably make matters worse rather than better. As you intimate, Professor Prichett has for many years been practically an assistant in the Coast Survey work and is entirely familiar with its methods of work. He is above all a man who makes friends and a man who gets along well with his fellow-beings. I have dropped you this line simply to indicate that I feel you have unintentionally done a very able man a slight injustice in the article in last week's issue.

I want to add that Professor Prichett is not a politician in any sense of the word, and it is not a political appointment. The two appointments from Missouri under the present administration which have given the greatest satisfaction to the best citizens of the state are those of Mr. Hitchcock to Russia and Professor Pritchett to the head of the Coast Survey, neither of which was in any way sought by the incumbent or given as a reward for political work. JUSTICE.

[We have a high opinion of the judgment of our correspondent, who is in a way to know the facts. He did not write for publication; but we print his letter nevertheless, as we would rather err on that side if we must err at all.—EDITOR RAILROAD GAZETTE.]

Some Notes from St. Louis.

ST. LOUIS, NOV. 9.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It was my fortune to be invited on an inspection trip last week that was both profitable and enjoyable. An inspection car with seats arranged like an opera house, as a little boy said, preceded the engine and everybody was interested in scoring each section of track, whether he was a transportation or a mechanical man. The speed was only 20 miles an hour, so that one's eyes did not weary. The real enjoyment, however, was the assistant counsel of the road and his narratives of the claim department. He was a Sherlock Holmes,—the sort of man that remembered what the old lady's name was who came to the door on Tuesday after Grant's election at the third house on the right after leaving the mill when he was on the track of a man who had obliterated part of the number of a check in order to make a fraudulent claim for a trunk lost in a wreck.

Nothing is more conducive to harmonious feeling and hearty co-operation in their work, of men in all departments, than a rightly conducted trip of this kind—especially when the general manager shows the interest in the minor officials that this manager does.

The absorption of the little Chicago & Texas by the Illinois Central puts that line into Cape Girardeau on the Mississippi. Across the river is the Cotton Belt and also the Iron Mountain. The river crossing here is short and good, both in high and low water. I look for the establishment of a Chicago and Texas freight line via this route that will prove a formidable competitor to existing routes. In acquiring this line the Illinois Central, for the time being anyway, has outplayed the Eastern Illinois, which has been by degrees reaching southwest. The Illinois Central receives immediate benefit in securing a large coal tonnage which formerly went to the Eastern Illinois via Johnson City.

The Wabash announces a sleeper from Buffalo to Kansas City with the next change of time. The effect of this will be watched with interest. Few people know what a fine property Wabash is becoming. Every year a large amount is spent in betterments, all of which is charged to expenses. If the various securities, 1st and 2d income bonds, preferred and common stock, of this property could be merged into a new stock at about present market quotations for each, this new stock would be of real value. I am told the management claims that the passbooks were destroyed in the recent fire in the general offices. Not bad.

A valuable pamphlet has been issued by the Illinois Board of Railroad Commissioners of statutes relating to railroads in that state and also the rules of practice governing crossings. It is concise and complete—more so than any similar publication I know of in other states. I venture to say that few managers know that the Illinois statutes allow the use of electricity on steam roads. Paragraph 19 of the general act, approved June 2, 1891, says: "Seventh—(It is empowered) to receive and convey persons and property on its railway by the power and force of steam or animals or by any mechanical power." The Missouri law is worded exactly like it.

This city is at present much excited over the rivalry of the several electric lines in attempts to secure franchises on certain streets. Indignation meetings are being held to oppose the granting of many of the franchises. It reminds one of the race for the Arkansas cañon, and where might makes right. It is popularly supposed that all the really wicked men are in steam roads.

I understand that some new rails belonging to one of the Chicago roads in the northern part of the state are beginning to flow after three months in the track. Do the department stores in Chicago keep rails? or the engineering talent that prepared the specifications?

G. B. L.

The Anthracite Coal Trade.

During October and the first ten days of November the anthracite coal trade was threatened with a crisis because of over-production and warm weather, but now it is believed that the danger of demoralization has passed, and that a moderate improvement will mark the course of trade during the rest of this year. The conduct of the trade during the past ten months furnishes evidence that the large interests have been working together. Each interest has confined its output month by month within the allotment so exactly that the total of excesses at this time does not exceed one-half of one per cent., and even this has been offset by under-production by several companies.

It has been the policy to mine only as much coal as the market would take, allowing prices to care for themselves. It was believed that by restricting during the first half of the year when prices are low and demand limited, a heavy production could be made in the second half when conditions as to demand and prices were reversed. On this basis an output of 20,068,126 tons was made in the first seven months of 1897. This was a decrease compared with the corresponding period in 1896 of 2,563,775 tons. At the end of July the large crops and attendant good prices, the general trade revival and the restricted production up to that time caused an increase in output. The shipments during August were slightly in excess of 4,000,000 tons. Again in September 4,000,000 tons were shipped. At the end of September the trade was still 2,355,842 tons short of the 1896 production in the corresponding time. It was decided on the last named date, in view of the comparative stability and satisfactory level of prices, that the trade would take as much coal in 1897 as was mined 1896, or a total of 43,177,485 tons. This would necessitate an output in October, November and December of 14,931,956 tons, or at the rate of about 5,000,000 tons a month. Consequently orders were given to turn out 5,000,000 tons in October, and although the official figures have not yet been published, it is known that the figure named was slightly exceeded. This left 10,000,000 tons to be produced in November and December—an amount that would tax the maximum capacity of the mines at this season.

Toward the close of October it became apparent that there was more coal on the market than could be disposed of at current prices. A minority of the interests called for a halt, but their protests were unheeded and the month was rounded out with the production as noted. Its effect upon prices was a loss of anywhere from 10 to 40 cents per ton, and a disturbed condition at tidewater and in the East. Still the leading interests refused to curtail and entered upon the current month with mines in full operation, and conditions became so alarming that the Presidents of the anthracite roads interposed. The result of their conferences, more or less informal, was a decision to confine operations to shipments of 12,000,000 tons for the last quarter of the year instead of 15,000,000 as was first intended. This would make the year's shipments 40,247,529 tons against 43,177,485 tons in 1896. Five million of the 12,000,000 had already been produced and the output for November and December must be at the rate of 3,500,000 tons per month. This measure was necessary, but it is disappointing. The fact has been shown that 1897 will not be as good a coal year as 1896 by three million tons that the industry has actually lost ground steadily for five years. The 1897 shipments will be six million tons under those of 1895, one and one third millions under 1894, and three millions under 1893. On the other hand, some consolation is derived by producers from the better prices.

Prices reflected the surplus early in October. At the close of September stove coal was quoted from 5 to 10 cents in excess of $4 a ton net. The first week in October the maximum price was $4.10 to $4.25, and the average about $4.10. At the close of October $4 had been generally shaded, and a figure as low as $3.75 named to desirable purchasers on a basis of New York delivery. At least three companies, owing to the restrictive character of their market, were forced to sell at a concession in order to keep their lines clear, and this affected prices. Those companies having other outlets were firmer and did not mortgage their future business through contracts, which left them in a comfortable position and has enabled them to profit by the restriction.

The chief cause of the unsettled New England markets was the action of at least two of the lines that own barges in making a freight rate from 10 to 20 cents below the open current quotation, or the price at which competitors could secure charters. This caused the latter class to make a delivered price in Boston, which was a virtual cut of 10 to 20 cents on the Boston price of coal. This week there has been manifest a disposition to withdraw the low barge rates and prices in the East are stiffer in consequence. The Western markets are reported to be rather quiet with a fair demand in prospect. The comparative stability of tidewater prices thus far this season has been a matter of comment and congratulation in all circles of the trade. F. B. P.

Coupler and Brake Statistics Reported to the Interstate Commerce Commission.

On October 15 we published a table, compiled from reports made to the Interstate Commerce Commission, showing the percentage of freight cars, belonging to 40 principal railroads, which would probably be equipped with automatic couplers and air brakes by January 1,

COUPLER AND BRAKE STATISTICS.

Name of Road.	Cars owned Sept. 1, 1897.	Estimated per cent. to be equipped by Jan. 1, 1898.	
		With couplers.	With train-brakes.
Alabama Great Southern	3,437	55	48
Allegheny Valley	2,959	100	27
Ann Arbor	1,805	75	40
Atchison, Topeka & Santa Fe	24,772	50	93
Atlantic & Pacific	1,867	35	80
Atlantic Coast Line	4,807	94	67
Baltimore & Ohio (Receivers)	33,231	50	40
Baltimore & Ohio Southwestern	6,631	85	20
Bangor & Aroostook	1,320	90	48
Beech Creek	3,830	100	58
Boston & Albany	5,939	100	60
Boston & Maine	10,203	53	41
Buffalo, Rochester & Pittsburgh	6,517	67	25
Burlington, Cedar Rapids & N	4,626	84	36
Calumet & Blue Island	3,146		
Canadian Pacific	15,388	38	25
Central of Georgia	5,153	71	25
Central Railroad of New Jersey	19,928	58	20
Central Vermont	1,984	12	
Chesapeake & Ohio	13,927	55	43
Chesapeake, Ohio & Southwestern	2,505	10	
Chicago & Alton	6,599	38	18
Chicago & Eastern Illinois	9,146	50	37
Chicago & Erie	1,981	69	20
Chicago & Northwestern	35,017	94	67
Chicago & West Michigan	2,668	77	13
Chicago, Burlington & Northern	3,291	40	15
Chicago, B. & Q. (e. Mo. Riv.)	22,443	66	43
Chicago Great Western	5,148		
Chicago, Milwaukee & St. Paul	27,605	76	51
Chicago, Peoria & St. Louis	1,551		
Chicago, Rock Island & Pacific	16,388	68	42
Chicago, St. Paul, M. & O	8,775	100	75
Choctaw, Oklahoma & Gulf	1,335	100	0
Cincinnati, Hamilton & Dayton	7,310	25	6
Cincinnati, Jackson & Mackinaw	1,042	35	0
Cincinnati, N. O. & T P	3,816	43	39
Cleveland, Akron & Columbus	2,792	23	14
Cleveland & Marietta	1,057	15	
Cleveland, Canton & Southern	2,378		
Cleveland, Cincinnati, C & St. L	13,237	73	35
Cleveland, Lorain & Wheeling	4,349	60	2
Cleveland Terminal & Valley	1,418	5	0
Colorado Midland	1,478	50	100
Columbus, Hocking Valley & T	7,564	63	32
Columbus, Sandusky & Hocking	3,500	10	0
Delaware & Hudson	11,062	64	12
Delaware, Lackawanna & W	26,096	100	50
Delaware, Susquehanna & S	1,520	100	100
Denver & Rio Grande	7,610	5	100
Detroit, Lansing & Northern	1,218	84	1
Duluth & Iron Range	2,671	100	100
Duluth, Missabe & Northern	2,016	50	100
Duluth, South Shore & Atlantic	2,596		
Eastern Ry. of Minnesota	1,567	39	39
Elgin, Joliet & Eastern	2,000	40	40
Erie & Wyoming Valley	1,141	50	20
Evansville & Terre Haute	4,148	17	6
Erie	40,388	74	30
Fall Brook	3,277	85	50
Fitchburg	5,158	76	56
Flint & Pere Marquette	3,399	40	1
Florida Central & Peninsular	1,814	50	20
Fremont, Elkhorn & Missouri V	4,084	100	60
Galveston, Harrisburg & S. A	3,105	75	85
Georgia & Alabama	1,300		
Georgia	1,087	76	55
Georgia Southern & Florida	1,214	67	8
Grand Rapids & Indiana	2,945	75	127
Grand Trunk	27,213	100	70
Great Northern	12,161	75	75
Gulf, Colorado & Santa Fe	2,121	27	25
Hannibal & St. Joseph	1,673	60	38
Houston & Texas Central	2,325	45	50
Huntingdon & B. T. M	2,599	100	25
Ill. Cen., inc St. L., A. & T. H	23,235	50	41
Iowa Central	1,823	75	50
Kansas City, Fort Scott & M	6,847	17	23
Kansas City, Memphis & B	1,769	20	20
Kansas City, St. Joseph & C. B	1,015	70	42
Lake Erie & Western	5,132	60	50
Lake Shore & Michigan Southern	18,910	100	75
Lehigh Valley Railroad	25,223	70	134
Lehigh Valley Railway	1,914	100	100
Lehigh Valley Terminal	1,988	100	00
Louisville & Nashville	19,189	17	12
Louisville, Evansville & St. Louis	2,377	11	10
Louisville, New Albany & Chicago	5,208	32	32
Maine Central	3,288	33	33
Memphis & Charleston	1,157	80	30
Michigan Central	13,381	80	37
Minneapolis & St. Louis	2,286	60	35
Minneapolis, St. Paul & S. S. M	6,067	37	24
Missouri Pacific	11,949	44	10
Missouri, Kansas & Texas	8,814	58	61
Mobile & Ohio	3,587	44	18
Montana Central	1,250	75	75
Nashville, C. & St. L	5,067	2	2
New England	3,187	41	31
New Orleans & North Eastern	1,617	75	45
New York Central & Hudson River	38,897	100	55
New York, Chicago & St. Louis	7,206	76	23
New York, New Haven & H	10,010	100	69
New York, Ontario & Western	6 303	100	10
New York, Susquehanna & W	3,518		
Norfolk & Western	16,033	11	14
Northern Central	9,910	40	24
Northern Pacific	17,907	77	81
Ohio River	1,480	25	20
Ohio Southern	2,150	15	
Oregon R. & N. Co	3,006	19	61
Oregon Shortline & Utah Northern	4,317	41	84
Pennsylvania & North Western	1,265	70	60
Pennsylvania lines; w. of P	52,543	68	38
Pennsylvania Railroad	64,275	58	48
Peoria, Decatur & Evansville	1,356	0	0
Philadelphia & Reading	25,100	91	21
Philadelphia, Wilmington & B	3,986	71	61
Pittsburgh & Lake Erie	4,917	92	88
Pittsburgh, Shenango & Lake Erie	2,244	43	24
Plant System	4,608	40	15
St. Louis & San Francisco	5,794	60	60
St. Louis, Iron Mountain & S	8,878	39	10
St. Louis Southwestern	4,356	24	15
St. Paul & Duluth	2,250	15	15
St. Antonio & Aransas Pass	1,652	100	100
South Carolina & Georgia	1,189	38	30
Southern	19,540	80	48
Southern Pacific—Atlantic System	3,040	80	75
Southern Pacific—Pacific System	14,634	69	96
Terre Haute & Indianapolis	4,062	50	33
Texas & New Orleans	2,019	80	90
Texas & Pacific	4,473	50	50
Toledo & Ohio Central	5,472	45	17
Toledo, Peoria & Western	1,335	53	46
Toledo, St. Louis & Kansas City	1,786		
Union Pacific	10.174	64	90
Union Pacific, Denver & Gulf	2,888	55	73
Wabash	12,330	40	18
Western New Nork & Penn	8,204	72	7
West Virginia Central & Pitts	1,936	80	18
Wheeling & Lake Erie, including Toledo Belt Railway	5,680	38	19
Wisconsin Central	7,377	54	51
Yazoo & Miss. Valley	4,370	27	3

1898, the time when the Federal brake and coupler law must be complied with. We now give, in the table printed herewith, the statistics from each road which has reported, excepting those which report the number of freight cars owned as less than 1,000. Of the roads which we have omitted, a large proportion lie wholly within one state; and as many of them report no cars equipped with either air brakes or automatic couplers, there is room for the conjecture that they intend to claim exemption from the law on the ground that their business is not interstate. In this view of the matter the statistics of these roads are of but secondary interest and we have concluded not to take the reader's time with a long table. But anyone who wishes to learn the condition of the cars of every road can, no doubt, get a copy of the pamphlet from which we take these figures, by applying to the Secretary of the Commission, Edward A. Moseley, Washington. The pamphlet shows figures for April 1, 1896, and September 1, 1897, with the number of cars equipped between those dates. The tables show, incidentally, the effect of the hard times, many prominent roads reporting fewer cars owned in 1897 than in 1896.

It will be observed that a number of roads make no estimates for Jan. 1, 1898. Of these the Calumet & Blue Island had about 75 per cent. of its cars equipped with couplers on April 1, 1896; the C. G. W., 33 per cent.; C. P. & St. L., 80; C. C. & S. none; D. S. S. & A., 70; G. & A., 25; N. Y., S. & W., 80; and the T. St. L. & K. C., 39. The C. & B. I. had 40 per cent. equipped with air brakes; the C. G. W., 30; the C., P. & St. L., 60, and the G. & A., 20 per cent. The Central Vermont reports 4,338 fewer cars owned than in 1896 (6,322 then, 1,984 now), so that the number equipped now cannot be learned from the information given.

DRIVING-WHEEL BRAKES.

The pamphlet also gives the percentage of engines equipped with driving-wheel brakes on April 1, 1896. A great many roads report 100 per cent., and a large majority report 80 per cent. or more. We append a list of those reporting less than 70 per cent. of their engines equipped. Most of the roads appearing in this list have equipped a considerable number of engines since these percentages were reported, notably the B. & O.; B. & M.; L. & N.; L., N. A. & C.; M. & O. and P. & R., but the percentage this year is not reported.

Atlantic & Pacific	54	Minneapolis & St. Louis	19
Baltimore & Ohio	45	Mobile & Birmingham	25
Bangor & Aroostook	44	Mobile & Ohio	58
Boston & Maine	59	New York, S. & W	56
Canadian Pacific	30	Northern Pacific	65
Central Branch, U. P	51	Ohio Southern	53
Central R. R. of N. J	41	Oregon Railroad & N	50
Central Vermont	41	Oregon Short Line	36
Chicago & Alton	60	Peoria, Decatur & E	22
Cincinnati, Hamilton & D	53	Philadelphia & Reading	50
Cleveland Terminal & V	67	Plant System	68
Denver & Rio Grande	9	Rio Grande Western	6
Flint & Pere Marquette	58	St. Joseph & Grand Island	48
Florida Central & P	46	St. Paul & Duluth	8
Gulf, Colorado & Santa Fe	50	South Carolina & Georgia	61
Kansas City, Ft. S. & M	47	Southern California	68
Lake Erie & Western	50	Texas & Pacific	32
Little Rock & Memphis	31	Union Pacific	52
Louisville & Nashville	63	Union Pacific, D. & G	22
Louisville, N. A. & C	51	Wilmington & Northern	66
Maine Central	55	Yazoo & Mississippi Valley	42
Memphis & Charleston	59		

Since writing the foregoing we have received the report of the American Railway Association, containing statistics gathered by the Safety Appliance Committee of that Association last month (dated Oct. 20). These show, for 167 roads, owning 1,054,022 freight cars, that on July 1, 1897, 54.4 per cent. of these cars were fitted with automatic couplers and 38.8 per cent. were fitted with air brakes. Of the 31,413 engines reported, 87.9 per cent. were equipped with power (driving wheel?) brakes. Of 6,163 new cars under contract on July 1 all were to have automatic couplers and air-brakes.

The Embankments on the Hudson River Shore Lines.*

BY ARCHIBALD A. SCHENCK. M. AM. SOC. C. E.

The recent loss of a train of the New York Central Railroad, north of Highlands, has drawn attention to the river embankments of the two roads running along the Hudson River shore lines, the New York Central road on the east shore and the West Shore road on the west shore.

There is very little of the line of either road that comes near the deep water, and where it does so, the places demanding especial care are few in number.

The two conditions that create dangerous embankments, namely, a deep channel and its close proximity to a rocky shore line, exist chiefly through the Highlands, from Peekskill on the south to Cornwall on the north. There is only one portion of the Hudson shore line outside of the Highlands where a deep channel bears closely against a rocky shore and affects railroad construction. This extends along the west shore from a point about opposite New Hamburg to a point a short distance north of Poughkeepsie. North of this place and south of Peekskill the channel bears against mud flats of ample extent for safety wherever the railroads are close to the river.

The first "deep hole" encountered by the West Shore road, running southward from Cornwall, is at Storm King. The next is at Rose's, opposite Cold Spring, some distance north of "Target Hill." The third is just south of West Point dock. The fourth is at Cranston's. The fifth is south of Fort Montgomery, between Negro Creek and Popolopen Creek. The investigations made during construction of the West Shore road were probably unequaled in any railway construction as to expenditure both of time and money for engineering service. A hydrographic party was employed for many months under the writer's direction, with a special assistant and engineer force, and a capable boat's crew. The examinations included not merely soundings to determine the slope of the bottom, but numerous borings with rods at great depths, to determine the slope of the solid rock surface underlying the sediment of the river bottom. Wherever in the original location the line had been placed too far out and the rock embankment (no other material being used at the deep holes) had slid out, its course and location after the slide were traced and noted upon the charts and sections.

At the first deep hole, at Storm King, the line was moved in upon the solid rock at enormous expense, giving an immense depth of cutting on the upper side. At deep hole No. 2, at Rose's, a similar treatment was given to the trouble, but the rock not being so high, the construction work is not so apparent. At deep hole No. 3, south of West Point dock, the deep water ran parallel with a long straight cliff, instead of surrounding a rounding point, as at Rose's and Storm King, and it was finally decided to cut a ledge upon the solid rock along the whole extent of this cliff and place the line upon a solid basis, although this involved great waste of excavated rock, which could not be taken endwise and utilized.

Deep hole No. 4, at Cranston's, was an exceedingly difficult place. The cliffs are very high and steep; the channel was very close and deep, bearing in against this cliff formation sharply. It was a triple difficulty. North of the northerly or highest cliff the line was moved in until part of the roadway was on the original ground cut of water, and the rock filling was massed at this point, being carried northward from the rock cut. Great care was taken to have the excavated rock go northward into the deep hole, instead of having it blown sidewise into the river and wasted. Special inspectors of rock were appointed to see that this was done.

On the other two portions of this deep hole, No. 4, substantial bridge spans were introduced, although the solid rock had to be cut out at the inner corners of the spans in some places to admit of their erection.

Deep hole No. 5, at Fort Montgomery, is a double hole, lying on each side of a large rock cut. North of the cut the deep hole was "fought," as at Cranston's. The writer's judgment was in favor of a span here, but no north abutment could be secured except at very great expense for under-water foundations, the rock filling already put in making such work doubly difficult.

A very sharp swing inward was, therefore, given the line, a swing that travelers would object to less if the increased safety were fully understood. South of the rock cut a very heavy two-truss span was built.

At first the attempt was made to "fight" this hole. Repeatedly the rock filling was made almost across the bight, and repeatedly it went out "like a shot." Then a crib was attempted. It was completed, heavily anchored to the rock inshore by five enormous chains and by anchors running vertically down several feet into the rock. It, too, went out and slid into 160 ft. of water, at a distance of 300 ft. from shore. The traveler need have no uneasiness about this most difficult deep hole. The train carries him over it on a steel span of ample strength, resting on abutments cut out of the solid rocks along their entire width.

Looking across to the east shore, we note that in general where the difficulties exist on the west shore, the east shore is safe with ample bermes and easy underwater slopes. There are no records extant as to what examinations were made when the present railroad was constructed, or what the engineers in charge knew of the conditions, but the alignment shows that they were wide awake to the difficulties at these three places. At each of them the line was swung abruptly inward.

The indications of the underwater difficulties on the east shore are few, and appear to bring down to a very small figure the number of places that appear to have given uneasiness in the original construction. They also show that the engineers on the original construction of the New York Central road were keenly alive to the work of avoiding dangerous construction. Whenever there is any marked and unusual deviation from a normal location of the line of road, we can find some good reason for it.

The construction aimed at on the West Shore road at the deep holes was rock fill of sharp rock from the excavations. This construction has three advantages over a protected earth filling:

1. The sharp rock, by its sharpness and weight, gets a grip of the mud bottom, and the mud slope, however much lubricated by the water, has little or no effect as a smooth surface in sliding the mass out into the river. Where rock fills went out during construction, it was generally, as nearly as could be ascertained, because of the mud layer in which the rock fill had obtained a grip being too weak to sustain the increasing weight. The rock fill did not so much slide on the top of the mud as did both rock fill and mud layer upon the underlying rock.

2. The rock fill requires no protective wall. It is stable in itself and cannot be overthrown or eaten away by the water.

3. The interstices are in time gradually filled by the river deposits and the whole cemented together into one mass. A rock fill grows more stable with age. Where such a fill cannot be carried by the underlying mud slope, this is shown promptly during construction. With each month that it remains in place it settles more into the mud, because more cemented together, and increases in staying power.

The writer's object has been to show the limited extent and number of the difficult places. It is for the company and not the writer to define the cause or causes of the accident at Highlands, so far as the original construction and location are concerned. A test of nearly half a century with ordinary conditions, and of half a dozen years with modern heavy trains, would seem to be almost a final test.

* From the *Scientific American*.

A Brown Rapid Freight Handling Machine at Jersey City.

About two years ago the Pennsylvania Railroad Company asked the Brown Hoisting & Conveying Machine Co. to design for their Pier "J," Jersey City, a rapid machine for handling all kinds of merchandise and cean freight; speed of handling to be the greatest object, as the methods of derricks and cranes, which had been in use for the past 30 years, were too slow for the rapidly increasing business.

The Brown Hoisting & Conveying Machine Company designed and built the machine shown in accompanying engraving from a photograph, which has just been put into successful operation. It travels up and down the pier under its own steam, and is worked in all its functions by two men—an operator and a fireman. The engine and boiler are placed in the house on top, with ample room for two more engines for two other machines, which will be added later, and will be operated from the one engine house.

The machine will lift a load of five tons out of the hold

of vessels at the rate of 250 feet a minute, and lighter loads at much greater speeds. The apron over the water is hinged, so as to lift out of the way of masts, nd the machine is rigged with chutes and attachments for loading bulk material into box cars. Among the things lifted by this machine daily are sulphur, pyrites, kaolin and sand in bulk, and boxes, barrels, boilers, castings, lumber, steel rails, poles, pipes, etc.

The machine has only been in operation a few days but it has already shown some speed. For instance, by the old method 100 tons of sulphur was a day's work, while this machine has shown a speed equal to 500 tons in the same time, and it is expected that even this will be exceeded.

A similar plant was built several years ago for the Pennsylvania Railroad at Cleveland, O., and this plant has developed a speed of 4,000 tons of ore (which is the complete cargo of two large ocean ships), in 10 hours, which is almost phenomenal.

This machine on Pier "J" will handle from cars to ships, from ships to cars, or will transfer from ships to lighters or from car to car, and is always ready for any class of work without special rigging. When handling bulk material in tubs the dumping of these tubs is entirely automatic and is controlled by the one operator.

Washing Out Locomotive Boilers.

At the October meeting of the Western Railway Club a paper on "Washing Out Locomotive Boilers" was read by Mr. John Mackenzie, of the New York, Chicago & St. Louis. The paper follows practically in full, also an abstract of the very extended discussion.

We have been experimenting for some time in the treatment of the water, in what is known as the second-ary tank, and, to show the necessity of the treatment, the following analysis is given of the water which is supplied to locomotives at two of our principal water stations: Townwood contains lime as sulphates 103.5 parts per million; magnesia, 34.2 parts per million. Arcadia contains lime as sulphates 401 parts per million; magnesia, 86.5 parts per million. In other words, Townwood has 5 grains of lime sulphate per U. S. gallon, while Arcadia has 23.4 grains of lime sulphate per U. S. gallon.

Our method was to treat the water in the secondary tanks by proper solution of soda ash and lime, dissolving the chemicals before introducing into the tanks, thoroughly stirring and allowing the same to settle for 12 hours. The water was then pumped from the second-ary tank into the service tank.

I am free to say that we have not had the results that our chemist said we would have. By his treatment of small quantities of the water he has shown that he can remove 67 per cent. from the water taken at Townwood and 92 per cent. from that taken at Arcadia. We are still experimenting and are not yet ready to say that we have the only good treatment, but we are ready to say we have made a decided improvement in the water at these two stations. As a result of what has been done at these two stations, we have made quite a saving in the expense of maintenance in boiler work.

In the first place, it did not seem to make any difference whether the tubes had been renewed within a month or a year, so far as leaky tubes were concerned. After two or three trips after coming out of the shop, an engine using this water would leak about as badly as after running six months. The only question of how much leak there was, was the question of the amount of work done at terminal stations. The short-age of power necessitated the quick washing with the hot water method, and it seemed that the more frequently we washed, the more leaking there was. I therefore determined to experiment with one or two engines, with our most skillful engineers, and gave instructions to run the engines 2,000 miles between washing outs, instead of 400 miles, as had been our practice previously.

The experiment was made with two engines which came out of the shop a short time before. The tubes were made tight and the enginemen were told that they were to run the engine without being washed until the water got so bad from foaming, etc, that they would refuse to run the engine longer. This experiment was carried on for two weeks without washing and the report showed that the engines did not leak during the entire time. Our master mechanics were then requested to give some cause for these engines running without leaking, and they could assign none other than that of not washing them out. After a careful investigation of the matter as to the treatment of the engines from the arrival at to the departure from terminal stations the conclusion was arrived at that we might go further and fare no worse. It was then determined to extend the limit to 4,000 miles on the same engines. I should have said that the blow-off cocks were not used while on the line between terminal station, but the blow off cocks, as well as the surface blower, were used at the end of the run and also just before starting out on the run. The surface blower was used as soon as the engine was gotten out of the roundhouse ready for service.

In looking up the cause for this very welcome change we determined that the principal cause of leaky flues was too much washing out. We then determined to make a test on a passenger engine running 265 miles per day, and the engine was allowed to make 7,000 miles before washing, the same treatment as to the surface blower and blow-off cocks being carried out. The system was then extended to all engines in road service and the following reduction in daily expense may be interesting: Boiler washers, $7; boilermakers and helpers, $8; flue plugs, 22 cents; 32,000 gals. of water, $2.10; coal, firing up, etc., $3; total, $20.32. In addition to this, with 120 engines, we saved 10 hours on every engine in each 4,000 miles; or, in other words, we were able to give the transportation department an engine in less than two hours' time from the arrival of the train, ready for service again. We make no calculation as to what value this is, but we know we have increased the mileage materially and have not increased the expense of maintenance.

You will note that the water we have been compelled to use is not of the best; the analyses we have had from different chemists have reported uniformly that the water at Arcadia is unfit for steaming purposes.

We are very much interested in our method of treating water, as we believe that the proper time to treat water is before it is put into the boiler.

In addition to what has been said as to the saving, we are satisfied that we can get with this method from 6,000 to 10,000 miles more of service from a set of tubes than by the previous method of frequent washing, which, of course, must be considered as of some value.

I do not care to take up your time with any extended remarks in this line, but we are still following out the scheme, and we think that some of our neighbors who have taken advantage of the suggestion to abandon the frequent washing are also ready to say that they have had good results.

DISCUSSION.

Mr. BARR (C., M., & St. P.): I agree that he can use water with 23 grains of sulphate in it, and if nothing is used to precipitate the sulphate it will form a hard scale on the boiler. I will agree to run a locomotive which is using that water 7,000 miles, and possibly 20,000 miles, possibly 40,000 miles, but as far as my experience goes there is certain to come a time when the boiler will be practically filled with scale, unless there is some way of getting that out, which Mr. Mackenzie has not explained in his paper. Twenty-three grains of sulphate per gallon means a large amount of scale that must be deposited in the boiler for every gallon of water that is evaporated, and it must show itself in some place; the sulphates will show themselves as hard scale. If soda-ash is used in sufficient quantity, the sulphates will be precipitated as mud. You may dispense with the soda-ash to avoid the mud, but you are getting scale on the boilers, and it is a physical impossibility to get away from this fact.

I admit, however, that Mr. Mackenzie, makes one very decided point, and one which, in my opinion, has always stood in the way of the proper care of boilers. As long as you use the boiler purge, and do not watch and keep the mud out, you are a great deal worse off than if you did not use the purge at all for the time being. If the purge is not used, then after 50,000 or 60,000 miles the engines must go to the shops for new flues Now, with the use of the boiler purge, or any resolvent that will precipitate, as mud, the scale-forming elements in the water, the mud must be washed out, and if it is washed out properly the boilers will remain clean and free from scale.

I think that I am perfectly safe in saying that we have to-day 14 10-wheel engines that have not had the tubes renewed for more than three years, and to-day their boilers are about as clean as the day they went out. We have had tubes in some engines for over five years, and the fact of the matter is that to-day, with the use of boiler purge and proper washing out, defective tubes never necessitate taking an engine to the shop. It is always the tires, and if we can put something on tires to keep them from getting flanges on the outside, then I do not know what part will need repairs first. Before we use boiler purge and insisted on the men washing out thoroughly, it was always the tubes that made it necessary to take engines to the shop, and 50,000 to 55,000 miles service was the limit that could be gotten from the tubes.

Mr. MACKENZIE: I would like to answer Mr. Barr by asking him some questions. In our experience and in our observation of this non-washing-out, it was a remarkable fact that we never found any more precipitation in the boiler in the way of mud or scale, even when using this secondary tank treatment of which I speak, than we did before. After 4,000 miles of service we found no more mud on the mud-ring than we did when we washed out frequently. Now Mr. Barr speaks of his treatment of the water in the boiler and that he washes out frequently: the question is, where does this scale go to that is separated in the generation of steam? I think that it does not go to the bottom of the boiler. I believe that he gets no more mud out than he did before; the mud must go through the cylinders if that is the case. Now that is the thought that occurred to me, and it is a fact that the tubes in our boilers are giving to-day from 10,000 to 15,000 miles more service than they did before when we washed out frequently, and we find no more mud in the bottom of the boiler than we did before.

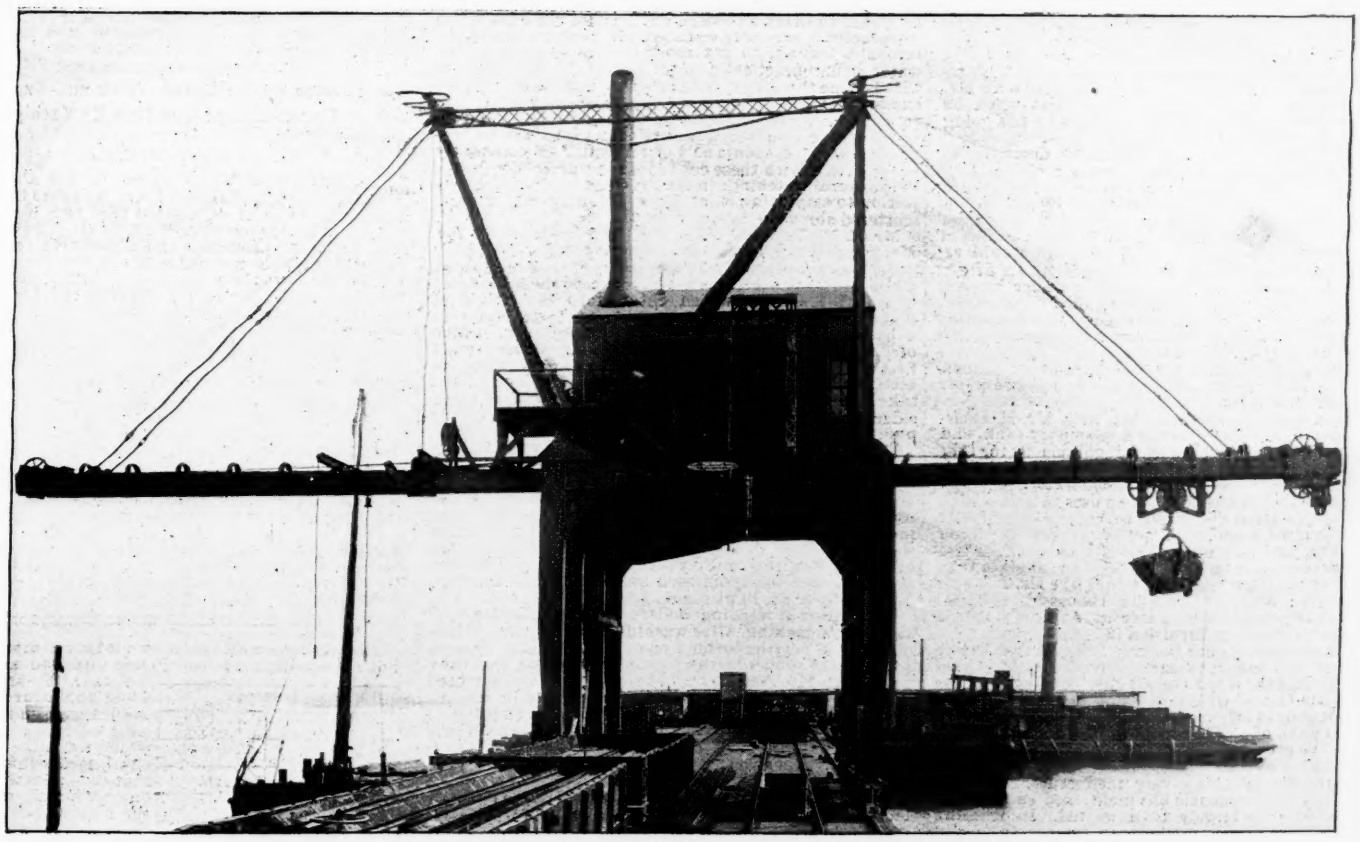
Mr. BARR: I have often said that if a purge is used and the washing out is neglected, there will be leaky flues, there will be more burnt sheets, than if the mud is allowed to settle on the sheet in hard scales, because the finer mud is a poor conductor of heat, while the hard scale is a pretty good conductor, and unless it becomes so thick that it is necessary to heat the flues to an extremely high temperature in order to heat through the scale it will not show anything detrimental.

Now as to whether any of this mud is carried over with the steam, I think I am safe in saying that that cannot be done unless the water foams and a little is carried over with the foam into the dry pipes, but aside from that none of the solid precipitates in the water will be carried over with the steam; they must stay in the boiler.

Mr. A. M. WAITT (L. S. & M. S. Ry.): There may be something in the method that Mr. Mackenzie has used in washing that has caused a peculiar contraction and expansion, and which has resulted in the leaky tubes.

Mr. MACKENZIE: I do not know that we do anything different from our neighbor; we undertake to wash out with hot water. In the first place, when the engine goes on to the ashpit, the surface blowers are used quite freely, the fire is cleaned and the ashpan dampers closed, and the engine is run to the roundhouse as carefully as possible and allowed to cool down. After the steam gets down to about 40 lbs. the water is let out and we simply use the hot water to wash out with, and hot water is used to fill the boilers, just too hot to bear the hand in it. I think that the whole secret of our running the tubes longer without washing out is in keeping the boiler-makers away from the boiler; we do not let them peck at it, and one of the first things we did was to discharge all the boilermakers and stop hammering the tubes.

Mr. JOHN BEAN (Cleveland, Canton & Southern): We have some very hard water on our line, that received at Canton being especially bad. This water is heavily im-



The Brown Freight Handler on the Pennsylvania Railroad Pier "J," Jersey City.

pregnated with scale-forming matter, the analysis showing 33.2 grains of solid matter to the gallon, of which 32.35 grains are scale-forming solids, principally carbonates and sulphates of lime. Previous to May, 1894, when we commenced the use of soda ash, we found it necessary to remove injectors from the Canton yard engines, which used no other waters, every three weeks, and give them an acid bath to remove the scale from the nozzles. On tubes and other parts of boiler the water would leave in a short time an extremely hard, flinty scale, very difficult to remove. We have at various times tried many compounds, with indifferent success, until about the date mentioned, when we commenced the use of soda-ash This, to a large extent, eliminated the trouble with injectors and kept the precipitate in the boiler in a much softer state, but has, on the whole, not proven satisfactory, due somewhat to the fact that we do not have proper facilities for blowing off. Since April 10 of this year we have been using, to a limited extent, a new purge, known as tri-sodium phosphate, which promises to give better results than anything heretofore tried. Before commencing its use we had samples of all waters sent to a chemist for analysis, to determine the proper proportion to use for each class of water. This proportion varies greatly, in some cases being only 1 oz. to 1,000 gals., and in others, Canton water, as high as 16 oz. per 1,000 gals. On the date mentioned, April 10, we sent a freight engine out of the shops with a new set of tubes and equipped with a good blow-off cock, and gave the engineer strict orders to use the compound as directed, and to use the blow-off cock at least once per trip. The result has so far exceeded my expectations that I ordered the boiler washed every three weeks instead of two, which was our usual practice, and I have this week, after a thorough examination of the boiler, ordered the engine to be run 30 days without washing. We are so well pleased with the performance of this compound that it is our intention to adopt it for all engines, in which case we will distribute it at the different water stations and pump it into the tanks in just the right proportion which the nature of the water demands, not depending on engineers to put it into the tender tanks.

Mr. A. E. MANCHESTER (C., M & St. P.): I was surprised in reading Mr. Mackenzie's paper to learn of the results that he obtained from washing out boilers. We have 10 wheel engines running in our heaviest service which have made over 250,000 miles, and we have 50 or 60 10-wheel engines which have run over three years since they had any change of tubes. We have also over 400 other engines which have been running three years without changing the tubes. But I will agree with Mr. Mackenzie in the last remark he made, that when he kept the boilermakers out of the fireboxes he was going a long way toward stopping the leaks.

Mr. WILLIAM FORSYTH: The two waters described by Mr. Mackenzie are quite different in their characteristics; one contains about four times as much sulphate of lime as the other. The Townwood water contains six grains of sulphate of lime and two grains of magnesia carbonate, which would make a total of eight grains of incrusting solids per gallon. Such water we would regard as being good. Water containing eight to fifteen grains of incrusting solids we would consider as good water; most of the waters on the Iowa lines of our road, which we regard as the best waters, contain about this amount. The other water from Arcadia, containing 23.4 grains of sulphate of lime to the gallon, if treated with soda-ash, would require 2.34 pounds per thousand gallons, which would cost about one and six tenths cents per thousand gallons to treat.

Now I would like to compare that with Mr. Mackenzie's expense in treating water in a secondary tank, and ask him what the cost per thousand gallons is for that process and why he believes that the secondary tank method is the proper way to treat the water. I would like to ask him what size of tank he uses to hold a supply sufficient to allow the water to remain quiet for 12 hours. He must have a 12 hours' supply of water there settling, and that must take a large tank, or else it is on a part of the line where very few engines take water. These are the questions I would like Mr. Mackenzie to answer: What it costs per thousand gallons? What is the consumption of water at Arcadia? What size tank is necessary to furnish a 12 hours' supply?

In regard to washing out boilers: I regard that as one of the most important things connected with engine service, and because it is a roundhouse job it is probably one of the things which has not received half the attention it should have received. The idea with many has been to wash out with warm water, and in the effort to do that the pressure has been reduced so that a great deal of washing out that has been done has been with low pressure and has been very ineffectual. This expense, which Mr. Mackenzie has mentioned as the cost of washing out, has largely been wasted. In washing boilers I would prefer pressure to temperature, and would try to get a pressure of nearly 100 lbs. at the end of the nozzle, so that whatever scale the water struck would be dislodged. I believe it would pay most any road to increase the size of the pump and to make experiments to find out what pressure was used at different roundhouses, and endeavor, if possible, to get the pressure as high as 100 lbs. With the little experience we have had with the use of soda-ash, I should say that the method of using it in the locomotive tank is one which is entirely practicable and which is quite economical and preferable to that of the wayside tank.

First, what is the cost per thousand gallons?

Mr. MACKENZIE: We do not consider that it costs anything beyond that of the ingredients that we use in the water. The man who tends the pumps introduces the lime and soda ash in quantities as required.

Mr. FORSYTH: What size tank do you use?

Mr. MACKENZIE: The tanks that have been used on the wayside are old tanks that are about worn out, and in putting up new tanks we simply put the old tanks down on the ground. The tanks have 50,000 gals. capacity. The method of treatment is simply this: The chemist gives us the proportion of compound necessary for each thousand gallons. This is dissolved in a barrel into which steam is conducted. The water is made as hot as possible, so as to be sure to dissolve all the ingredients that are put in; then it is forced by an injector through the feed pipe from the well into the tank, so that in pumping the water into the tank each thousand gallons are treated separately with the proportion of soda-ash.

Mr. FORSYTH: Why do you prefer that to putting the stuff into the tank?

Mr. MACKENZIE: The results have shown that the lime can be precipitated and settled on the bottom of the tank. The water is, as I said before, pumped into the boiler and each 1,000 gals., treated separately After that is done, a circulation is created in the tank by a steam jet from the pump boiler, agitating the water thoroughly and then allowing it to stand still for 10 or 12 hours. In the tank that I specially speak of we can treat about 50,000 gals. every 12 hours. After the water has settled for 12 hours, it is pumped from the auxiliary tank into the service tank and fed from there into the tank on the tender of the locomotive. After repeating this for four days, we have taken out 10 in. of sediment from this tank. This is done by simply lifting the trap in the bottom of the tank and letting the sediment run out.

PRESIDENT DELANO: Mr. Smith, the chemist of the Chicago, Milwaukee & St. Paul, is here; we would be glad to hear from him on some of the points brought out in this discussion.

Mr SMITH: One thing occurred to me on the question of scale forming from the residue of incrusting solids in the water that has been purified in the secondary tank—it is quite possible that Mr. Mackenzie is using the system of purifying in the boiler without knowing it. That is to say, the average chemist would figure slight excess of soda-ash to treat the sulphate of lime present in the water, and that excess would remain still active and would take care of the remaining lime salts after the water gets to the boiler. In that way there would be formed a small amount of mud, instead of scale.

On the general subject of purification in stationary tank, it may be said that that is the ideal method of furnishing the boiler with perfectly pure water. The method of precipitating by soda-ash and lime is what is known as Clark's process, and was introduced something like 50 years ago in England. In this process the sulphates are changed to carbonates by the use of soda-ash, and usually remain in the water in solution. If sufficient soda-ash be added, for instance, to Lake Michigan water, to transform the sulphate of lime, there would be no precipitate whatever, the carbonates which would result would be held in solution by the carbonic acid of the water. It is then proper to precipitate those carbonates which are already present in the original water and those formed from sulphates and that may be done by any method that will remove the carbonic acid gas. Where the water is purified in the boiler it is done by the heat; in the Clark process it is done by the lime, and this lime becomes the chief difficulty in the process; it must be adjusted as to quantity very exactly. The principle depends on the absorption of the carbonic acid by the slaked lime, producing carbonate of lime, which is the same ingredient that we wish to remove from the water. If quantities are correctly adjusted, both the added lime and that previously present are precipitated. If considerably too little lime is used, it happens often that there is sufficient carbonic acid to keep the whole thing in solution, and the purified water is worse than the original water. That has often happened in Clark's process, but it is not the case where the process is carefully watched. It is possible, by very frequent testing, to get most admirable results, the water being practically pure, but at the places where that is done the water is tested every half hour for the excess or deficiency of lime. The lime, of course, is a very crude product, and varied in composition, and in dissolving it a variable quantity comes into active employment; the carbonic acid of the water is constantly varying, and with these conditions the process requires very careful watching; in fact, it constitutes a chief objection to employing it at every country water tank scattered along the railroad.

Mr E. M. HERR (N. P. R. R.): If I understand Mr. Mackenzie's explanation in answer to Mr. Forsyth's question, it seems to me that it is hardly fair to say that the cost of this process is nothing except the actual cost of the ingredients which enter into the water. I understand that a settling tank at least equal in capacity to the supply tank is necessary, which of course must be supplied. The water must first be pumped into this tank, remains there to settle and afterward is pumped out, which requires, as I take it, perhaps not double pumping, but at least I consider it a larger amount of pumping than the regular pumping service.

The matter of purification of water before it reaches the boiler of engines has always been an attractive one to me, and I think, as Mr. Smith just said, it is the ideal process. My understanding is that it is not in general use because it is quite expensive to handle it so as to produce results which are sufficiently good to warrant its use. I think, if my memory serves me rightly, that Mr. Barr had this matter investigated some time ago, and that was the conclusion reached on the Chicago, Milwaukee & St Paul road.

The matter of washing boilers and the difficulty with the boilers leaking after washing is a very interesting one and a very important one. I have made quite a study of the proper method of boiler washing and fully agree with Mr Forsyth that the pressure of water used is an exceedingly important point. I found in investigating this matter not long ago that, in attempting to use hot water, the actual pressure in the hose used was about 50 to 60 lbs., and an examination of the boilers showed that they were very imperfectly washed. I have since substituted other methods, and we are now obtaining a pressure of not less than 100 to 120 lbs. per square inch, and the boilers are very much more perfectly washed. There is quite a decided improvement, not only in the appearance of the boilers, but in their performance and in the absence of leaky tubes.

I asked Mr. Mackenzie how hot the water was with which he washed, because the matter of washing with hot water has been of quite serious concern with me; at some points on our line we have no facilities for making the water hot; it is impossible to get hot water, and we are obliged to wash with cold water. On some of those divisions we sometimes have our power run very hard, and I found we were turning out engines very quickly, and sometimes washing them in time which seemed to me inadequate even with hot watar. Much to my surprise, however, in looking the matter up, I found that we had as few leaky tubes on that division as on any division on the road, although the water was absolutely cold with which we did the washing. Following this matter up, I thought I discovered that the cause of leaky tubes in boilers was not alone, or not principally, due to the way in which they were washed, but was largely due to the treatment they received before they reached the washout pits; putting them over a clinker pit, putting the blower on full, and allowing a lot of cold air to circulate through the tubes while the boiler is hot, is in my mind a very frequent and common source of leaky tubes. I think the matter of expense of the secondary tank method should be looked into very carefully. If it can be used for little or no expense, it certainly seems to me the thing to do.

Mr MCINTOSH (C. & N. W.): It occurs to me that some of the trouble which Mr. Mackenzie experienced with leaking tubes is the result of the method of cooling down the boiler. I believe in using hot water for washing out a warm boiler. Of course a cold boiler can be washed out with cold water without injury. We find a cheap way of obtaining hot water is to use an old locomotive tank and, in blowing off steam from the boilers, to blow it into this tank; also the exhaust from the washout pump can be arranged to run into a coil which passes through this tank, warming the water all the time that the pump is working. We find when we start in with a tank full of water that we have sufficient warm water to complete an ordinary washing out, with the additional help that we receive from the exhaust of the pump.

I fully agree with what Mr. Forsyth and Mr. Herr have said in regard to the pressure formerly used in the attempts to use the hot water ejector. The force was entirely insufficient to do good work. From 100 to 150 lbs. must be used to obtain satisfactory results.

I find that we can blow out frequently without bad results. It must be done intelligently; surface blow off cocks can be used when the engine is working, and the water is stirred up and in ebullition, as a good deal of the sediment, especially all the lighter substances, are carried to the surface of the water in the boiler with those conditions, and a suitable blowing-off apparatus will carry off a great deal of matter. Blow-off cocks located at the bottom of the boiler are used to the best advantage when the water becomes settled, then the sediment can be blown out by putting on the injectors and opening the blow off cocks at the same time.

Mr WILLIAM GARSTANG (C., C., C. & St. L.): For everyday work I think Mr. Mackenzie's method of washing out boilers is a good one. We have been conducting the tests now for seven months on one engine, and we are running this engine an average of 4,000 miles between times of washing out. The engine is in heavy freight service. This engine had been in service for 15 months, and was to be sent to the shop when we began Mr. Mackenzie's method of washing out boilers. Since we commenced that practice, confirming what Mr. Mackenzie says in his paper, the tubes do not leak, the engine is causing no trouble, and we are likely to get 8 or 10 months more service out of it.

Mr. MACKENZIE: It seems to me that we are losing sight of the point that I wanted to bring out. What I wanted to bring out was this. Too frequent washing of the boilers is injurious to tubes. We are satisfied that such is the case.

Mr. J. F. DEEMS (C., B. & Q.): If we take the idea suggested by Mr. Mackenzie as a general proposition, and work it out in a manner to meet the requirements in each case, this paper is going to be worth as much to the railroads of this country as any paper that has ever been presented before this organization.

Mr WILLIAM FORSYTH: Our chemist gave us advice in regard to the amount of soda-ash necessary, and the amount corresponded very closely with the amount Mr. Mackenzie found best. The simple rule is this: For every grain per gallon of incrusting solid in sulphates, use one-tenth pound of soda ash to the thousand gallons. The twenty-three grains which Mr. Mackenzie reported for the Arcadia water, would require 2 34 lbs. of soda-ash, which is just about what he is using.

Some Notes on the Speed Trials and Experience in Commission of Our New Battleships.*

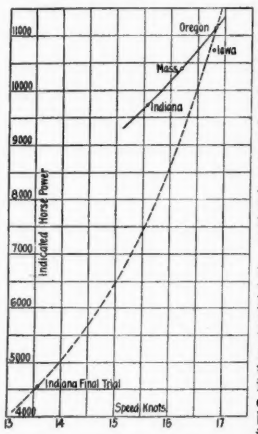
BY PHILIP HICHBORN. †

The four battleships referred to are the Indiana, Massachusetts, Oregon and Iowa. The first three named are of the same class, and the first two being by the same builder are practically identical. The Oregon has various minor differences and departures from her sisters which are the natural result of her construction by a different firm, the most marked difference being the use of hydraulic power for turning the heavy turrets and steering the ship, while steam is used directly for these purposes on the Indiana and Massachusetts.

The table below gives the dates of trial of the battleships, and the corresponding indicated horse-power, speed, mean draft and displacement.

Vessel.	Date of trial.	Displacement in tons.	Mean draught.	I. H. P.	Speed in knots.
			Ft. In.		
Indiana.....	Oct. 18, 1895.	10,255	23 11	9,738	15.55
Massachusetts..	April 25, 1896.	10, 65	23 11½	10,403	16 20
Oregon.....	May 14, 1896.	10,250	23 11	11,111	16 79
Iowa.	April 7, 1896.	10,340	24 00	12,105	17.09

The trials were all made over a long course, the four-hour run being made half in one direction and half in the other. Vessels anchored along the course observed the direction and force of the tidal currents, the effect of which was already partially eliminated owing to the fact that two runs were made—one with and one against the current. The indicated horse-power was observed with great accuracy, and, altogether, it may be said that the results are as accurate as it is possible to make them.



Speed Trials of New Battleships.

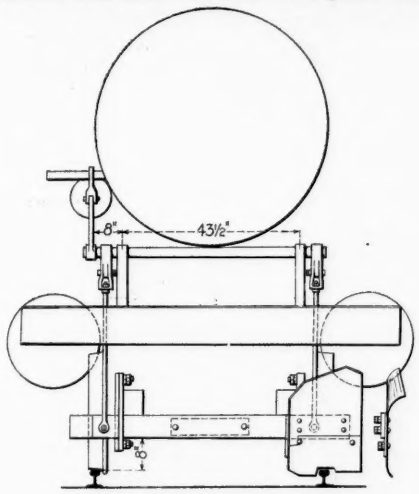
The appended curve shows the speed and power of these vessels, reduced by Froude's law of comparison to a common displacement, namely, that of the Massachusetts, 10,265 tons. It will be seen that the points corresponding to the Indiana, Massachusetts and Oregon have been joined by a curve; and if the circumstances were not fully known, this curve might be regarded as representing very closely the usual speed curve for anyone of the three ships. As a matter of fact it would be wrong to so regard it, and from the position of the spot marked "Indiana, final trial," which represents the speed and power on a trial of the Indiana, made in April, 1896, it is evident that the curve joining the three spots would not pass near that representing the Indiana on final trial. It should be remembered, by the way, that in the final trial the Indiana was not pushed to her maximum speed under forced draft, the trial being one required by the contract to determine the satisfactory behavior of the ship and machinery for 48 hours at sea, after she had been in the hands of the government for a certain length of time. As a matter of fact, the peculiar nature of the curve joining the three spots for the three ships is due to the difference in the condition of their bottoms at the time of trial. When tried, the Oregon had been less than one month out of dock, the Massachusetts five months and the Indiana 19 months. The

* From a paper read at the fifth general meeting of the Naval Architects and Marine Engineers, held in New York Nov. 11 and 12, 1897.

† Chief Constructor, United States Navy.

Indiana was tolerably foul, the Massachusetts somewhat less so, and the Oregon clean. The results show clearly the effects upon speed of but a moderate amount of fouling, for though the Indiana had been 19 months in the water when tried, she had been all the time in fresh water, and was so little foul that her contractors decided to offer her for trial as she was, instead of going to the expense and risk of sending her to Halifax to be docked. On final trial, in April, 1896, the Indiana was clean, having just come out of the dock. It may be said that the results of the trials of these vessels, as regards speed and power, compare very favorably with those of large battleships abroad, and indicate also that our battleships now building will give results, as regards speed, agreeing most satisfactorily with the estimates.

The Iowa is of somewhat different type from the Indiana class, and about 1,000 tons larger Both types of vessel have given good satisfaction in service, and experience with their strong or weak points will be



Q & C Snow Flanger.

very valuable in case of future battleships. It may be remarked, in passing, that our battleships now under construction are, in many of their features, a compromise between the Iowa and Indiana types, which are themselves not very widely dissimilar, so that our battleship fleet to date, built and building, while its members differ from one another, will have to a marked degree, except as to their batteries, that feature of homogeneity which all authorities recommend as desirable.

I believe that the predominant opinion among our naval officers who have had experience with these vessels is that a trial speed of 16 knots is sufficient for our battleships under present conditions and will not need to be materially increased until foreign battleships promise materially greater speeds than they now reach, and that the policy which the Navy Department has followed from the first with these battleships, namely, to give them offensive and defensive power sufficient to enable them to cope with those of any foreign country, without insisting on giving them the speed or carrying the amount of coal and supplies which the circumstances of various foreign navies render desirable, thus making our ships materially smaller and less costly than they would otherwise require to be, is correct.

I do not wish to be understood as stating that our battleships are perfect, or that in our experience with them so far there have not been troubles and difficulties and minor accidents of various kinds. It should be remembered, however, that these were the first battleships designed or built for our navy, and I do not hesitate to state that they are vessels concerning which no one who has any connection with them has cause to be ashamed. I may mention as perhaps the most serious accident which has occurred on any of these vessels, the breaking adrift of the unbalanced forward turret of the Indiana in a very heavy gale about a year ago. The revolving weight of this turret is about 489 tons, and its center of gravity is about 3½ ft. from the axis of rotation. The conditions and circumstances were such as to call for the display, in the highest degree, of what the builder of the Indiana has characterized as "battleship seamanship," and I believe the difficulties on that occasion were grappled with and overcome promptly and fearlessly.

The behavior at sea of the Indiana class has been all that could be expected from vessels of that type. Owing to their comparatively low freeboard, they are wet in heavy weather, but they have rarely encountered weather conditions sufficient to interfere with the manipulation of their guns. As a general rule, they have been remarkably steady, but, as was to be expected, there are possible conditions of sea which make them roll heavily. They were originally designed to have bilge keels -the value of bilge keels to check heavy rolling being well known; but when it became evident that docks adequate to take in vessels with bilge keels would not be completed as soon as the vessels, it became necessary to leave the bilge keels off. Experience at sea demonstrated, as was to be expected, the desirability of these appliances. They have already been fitted on the Massachusetts and will be fitted on the other vessels of the class at the earliest opportunity. The Indiana would have had them before this date but for the unfortunate breaking down of Dry-Dock No. 3 at New York.

As illustrating the behavior of the Massachusetts at sea, I may quote from the report of her commanding officer, on a trip from Boston to St. Johns. During this trip the Massachusetts passed within 250 miles of the center of a cyclone, encountering a wind which reached the force of 10 on the Beaufort scale, and was accompanied by a very heavy sea. The vessel slowed down during the height of the storm, and her Commanding Officer reports as follows: "During this time the ship behaved beautifully, never making less than six knots per hour, nearly on her course, and never rolling over five degrees. Her steadiness was so remarkable during the whole passage that it must be, in a great measure, attributed to the bilge keels."

One feature of the Indiana class, as regards which they have been markedly successful, is their steering. Turning trials of the Indiana, made Feb. 24, 1896, showed a tactical diameter of but three times the length of the ship, an exceptionally small value. Her maneuvering qualities and steadiness on a course are all that could be expected from a short, broad, comparatively shallow vessel.

A Snow Flanger Operated by Compressed Air.

The engravings show the Q & C-Priest snow flanger, worked by compressed air. The flanger consists of a crossbar to which the cutters and deflecting plates are fastened. This is hung on the engine truck, where it is carried in a vertical slot at the front end of the outside equalizers. To accomplish this, an extension in the form of a plate is made at the front end of each equalizer bar. The front edge of this plate projects about 1 in. ahead of the flange of the wheel, while the back edge comes against the front of the journal box, so that the backward thrust of the flanger will not come on the equalizers. Further, an angle iron is bolted on the inside of the extension so as to bear against the inner end of the journal box and so prevent undue side pressure on the equalizers.

The crossbar can be moved vertically in the slot at the end of the equalizers by two links, or lifters. These links are slotted at their upper ends so that the crossbar, when lowered, rests at the bottom of the slots in the equalizers and is unsupported by the lifters. In this way a uniform cut is maintained, the height of the flanger above the rails being independent of any movement of the engine springs.

The cutters and cutter-wings are fixed to the ends of the crossbar, and the whole can be raised and lowered by compressed air. For this purpose an 8-in. air cylinder is placed under the running board of the locomotive. Connected to the piston rod of this cylinder is a reach-rod, the forward end of which connects with a lever at the ends of a shaft which is supported in bearings fastened to the engine frames. Other arms which are fixed at the ends of this same shaft are connected with the vertical links, or lifters, and serve to raise and lower the cutter bar in the slots. At the rear end of the reach-rod there is a lug which engages with a gravity latch which supports the flanger when not in use. The device is controlled by an air valve, placed in the cab, by which compressed air is admitted to, and released from the head end of the air cylinder.

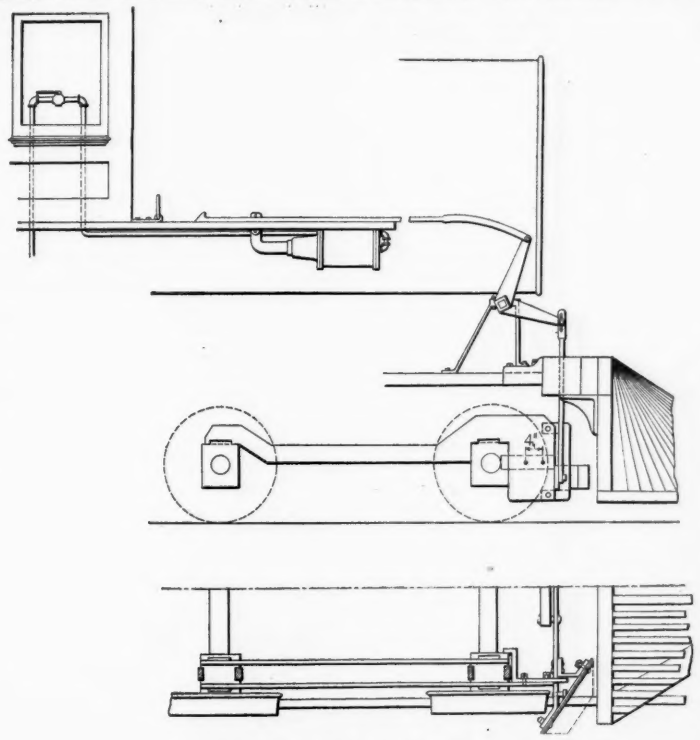
As the position of the cutter-bar is independent of any motion of the engine on its springs and also of any slight irregularities in the track, the cutter-knives may be set as close as 1¼ in. to the sides of the rails and ¾ in. above their tops, with little danger of being destroyed. The flanger allows the use of a snow plow, and may be left on the engine all the time if the hangers be disconnected and the crossbar blocked up. It is made by the Q & C Company, of Chicago.

Electricity for Trunk Line Working.

BY DR. CARY T. HUTCHINSON.

At the October meeting of the New York Railroad Club the subject for discussion was "The Engineering Side of the Application of Electricity to Standard Railroading." Mr. Potter, of the General Electric Company, who was to have presented a paper, was unable to prepare it, and the discussion was verbal and informal. We reproduce the remarks of Dr. Hutchinson in that discussion. They are very wholesome reading.

Something has been said about electricity, but nothing regarding trunk line conditions. I am of the opinion



Q & C-Priest Snow Flanger.

that the latter is by far the more important side of the question, and if electricity is ever applied to trunk lines it will be due chiefly to changes made in the conditions of the trunk line service and very little to improvements in electrical machinery. Although the electric locomotives which are built to day are as far superior to the one shown on the board as is New York Central "No. 999" to the first "Rocket," yet I think that the application of electricity to trunk line service is no nearer than it was at the time this locomotive of Mr. Edison's was built. The electrical appliances have improved steadily, but the trunk line conditions have become worse, from an electrical point of view; that is to say, freight trains are heavier, express trains run faster and are more numerous, and the entire tendency has been away from conditions favorable to electricity.

The chief condition for economical electrical service is that the train service shall be frequent; that is to say, that the machinery, including the copper feeders, be always kept loaded, doing work to its full capacity, nearly all the time, instead of two or three minutes out of the hour, as would be the case were an attempt made to run the present trunk line service with electricity.

The only place in the country where there is anything approximating to the application of electricity to trunk line service is at Baltimore, and here the reasons leading to this application were not primarily those of economy. Incidentally the change has proved economical, but the cause for this application was the comfort and convenience of the passengers, rather than any saving in the operation. The locomotives here, as you may know, weigh about 200 000 lbs., and have given on test a drawbar pull of 65,000 lbs., probably as heavy duty as any steam locomotive has ever given.

This question is not changed materially in my opinion by the use of alternating currents in any form; it is purely and simply a question of keeping the machinery at work all the time and of supplying sufficient track facilities.

I wish to disabuse your minds of the impression that probably prevails that the work of the New York, New Haven & Hartford on their third rail system has advanced in any degree this application of eletricity to trunk line conditions. The service given by the N. Y., N. H. & H. is nothing more than trolley service on a large scale, with heavier cars and higher speeds, and with the trolley wire put on the ground in the form of a third rail. Engineering difficulties have, of course, been met with and overcome, but there is no relation between this work and the topic under discussion. I think a great deal of harm has been done by the indiscriminate laudation of this third rail system, much of it coming from the N. Y., N. H. & H. officials. It has created an impression on the minds of the public generally that electricity is applicable to any kind of a steam line. In one case particularly that I know of this loose talk was the cause of a loss of nearly $150,000. The people in question had gone to the expense of developing a water power plant for operating an electric road under conditions that were utterly unsuitable for electric service. I was sent out to examine it, and advised them to discard all their electrical machinery and use steam locomotives. The head of the enterprise told me that he had been led to the adoption of electricity by the fact that the N. Y., N. H. & H. road was using it.

Street Railroads and Municipal Corporations.

The special committee appointed at the last session of the Massachusetts Legislature to investigate the relations between municipal governments and street railroads has held a few hearings in which the subject has been considered from both sides. In the early hearings the mayors of a number of the cities, engineers and others directly connected with city governments spoke of the necessity of making more explicit laws governing the street railroads. The hearing of the street railroad men was opened on Monday of this week and continued through Tuesday, Wednesday, Thursday and Friday. On Monday Mr. Everett W. Burdett, Counsel of the Massachusetts Street Railway Association, introduced Mr. Prentiss Cummings, First Vice-President of the West End Street Railway Co., who expressed the belief that the first duty of every street railroad company was to its stockholders, and said that, so far as the West End was concerned, it must pay 8 per cent. dividends on its preferred stock as this was guaranteed, while the market price of its common stock only netted five per cent. when the dividend was eight. Its next duty was to its employees, and the West End paid them $2.25 per day, the public demanding a high class of service. If there were any earnings left after fulfilling these obligations he thought the public had a right to expect the benefit. He commended the fairness of the various mayors who had spoken in recognizing that the companies already had many burdens imposed on them. He thought that instead of compelling the companies to reduce fares, or compelling them to pay money for widenings or other improvements, it would be better to compel them to spend the surplus in increasing the efficiency of their service; for while municipalities could borrow money for street improvements at 3½ per cent., they would secure 100 per cent. return for money spent by the companies in the way suggested. Then he cited the growth of Brookline from a valuation of $5,000,000, when the horse cars first entered it, to $18,000,000 in 1887 and $47,499,000 to-day.

Mr. N. Sumner Myrick, of Boston, spoke for the suburban and country roads, which he said could stand no further burdens, the towns compelling them to pave, macadamize and make other expensive improvements, and the State Highway Commission imposing many additional

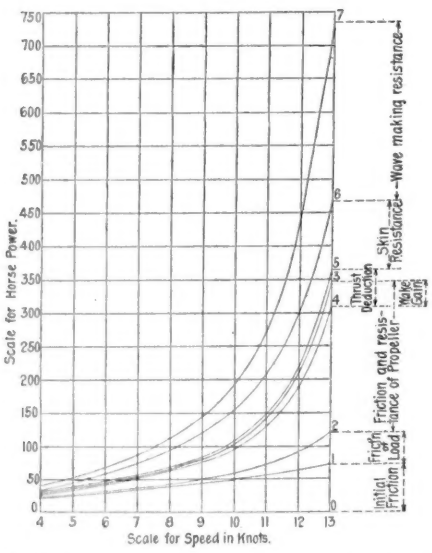
burdens. One company paid out $40,000 in one year for changes demanded by the State Highway Commission. This money could neither be capitalized nor bonded, but must be carried as a floating debt to come out of earnings. The Chairman said that the trouble had entirely come from a vital error in the early history of street railroading, when it was assumed that there was an analogy between electric and steam railroading.

On Tuesday, Mr. Willard B. Ferguson, President of the Worcester, Leicester & Spencer; Gloucester & Rockport, the South Framingham, Holliston & Milford, and other roads, testified that in building and operating some 20 electric roads in Massachusetts, he was positive they had not cost the cities and towns a cent which they would not have paid out in ordinary repairs for highways. His roads mostly ran by the side of the highways and in building the companies had reduced the grades to eight per cent., and widened and paved wherever necessary. He did not think onerous burdens had been put on him by cities and towns, but thought his companies were doing all they could. He advocated the dividing of the corporation tax on street railroads and paying it to towns and cities on the basis of the number of miles of track, as a means of reducing contention.

P. F. Sullivan, General Manager of the Lowell & Suburban road, advocated the same policy. He thought his road would have less expense, less risk and fully as much income if it had but 20 miles of track, the amount it had 10 years ago. All the additional track it was operating was simply extensions which had been put in as a payment to the public of its share of the profits. He believed that if the climatic, labor and coal conditions in Boston were like those of Baltimore, the West End road could easily pay a franchise tax of $1,000,000 and yet not cut its dividends. He also remarked that if the conditions in Boston were like those of Toronto, and the West End could charge another fare as soon as its patrons crossed the Boston line, instead of giving free transfers on all its lines, it would increase its earnings 50 per cent. He favored an unlimited franchise, with the right of revocation, subject to appeal to the railroad or some other commission.

Progressive Speed Trials of the Boston Police-Boat Guardian.*

The Guardian is a copper-sheathed wooden boat designed by Mr. Arthur Binney, built and engined by the Atlantic Works, and in general form and appearance resembles an able towboat. The tests were made by the permission of the Police Board in February of the current year, under my supervision, by my assistant, Mr. C. H. Clark, and four members of the fourth-year class of the Massachusetts Institute of Technology. The results were calculated and all diagrams given here were made by Mr. Wm. H. Allen, Jr., and presented as his thesis on graduation from the course in naval architecture. During the tests the boat was in charge of her regular crew, who ran her at designated rates of revolution of the engine over a course selected in the Nantasket Roads, on a line extending from Boston Light to Sunken Ledge Beacon. Ranges very nearly at right angles with this course were found, one from Great Fawn Bar to False Spit Beacon, and the other from Deer Island Light past a sea-wall on Galloups Island. A careful triangulation gave for the length of the course 5,675.7 ft., or 0·9335 of a knot. Runs were made back and forth over the course at several speeds, during which the engine ran steadily at a very nearly constant speed of revolution, the turns being made without changing the regulation of the engine. It is interesting to know that the actual time of the trials was not more than three hours; if it had been possible to control the boat longer so as to make more runs and to choose the stage of the tide at which the runs at slow speed were made, it is believed that the trials would have been entirely satisfactory, for the actual work is simple, positive and direct when in the hands of properly trained observers. One object in presenting this paper is to induce shipowners and shipbuilders to make progressive speed trials and so work up and present the results that they may be accessible.



Distribution of Power of Police Boat "Guardian," for Different Speeds.

At the time of the trials the principal dimensions of the boat were:

Water-line length	104.5 ft.
Mean draught	8 4 ft.
Beam at water line	20.0 ft.
Displacement	222 tons
Wetted surface	2,440 sq. ft.

The boat is propelled by a triple expansion-engine which drives a four-bladed screw. At the time of the trials the propeller had temporary cast-iron blades which have since been replaced by bronze blades of the same form and dimensions. The dimensions of engine and propeller are:

High-pressure cylinder, diameter	12¼ in.
Intermediate " "	19 in.
Low-pressure " "	33 in.
Piston rods, diameter	2¾ in.
Stroke	24 in.
Steam pressure, about	165 lbs.
Diameter propeller wheel	7 ft. 4 in.
Pitch " "	11 ft.
Total developed area	23.9 sq. ft.
Diameter boss	21 in.
Total developed area of blades	23.9 sq. ft.
Pitch ratio; pitch ÷ diameter	1.5

The accompanying curve 7 of the diagram shows the entire power developed by the engine given by line 3, the difference between curve 7 and curve 6 being the power expended in wave-making. The distribution of power for 12 knots is given in the following table:

	Per cent.
Initial friction	14.3
Load friction	6.0
Friction and resistance of propeller	27.8
Thrust deduction	7.4
Skin resistance	18.3
Wave resistance	31.4
	105.2
Wake gain	5.2
	100

It is to be borne in mind that the highest speed actually reached was 12.33 knots, at which the engine developed 530 H. P. The curve of power extended to 13 knots shows at that speed 735 H. P., an increase of 200 H. P. for a gain of only two-thirds of a knot, showing that the boat was driven up to her maximum speed, which could not be much exceeded without adding very largely to the motive power. Or it may be said that different lines and a greater length should be assigned to a boat which is intended for higher speeds.

*A few extracts from a paper by Prof. C. H. Peabody at the fifth general meeting of Society of Naval Architects and Marine Engineers, New York, Nov. 11, 1897.

Spoil Car for the Eastern Chinese Railroad.

We show herewith the style of car adopted by the Eastern Chinese (Manchurian) Railroad for the building of its line.

Figures 1, 2, 3 and 4 give a clear idea of the chief features of this car, which recalls the coal trucks in common use on the English railroads. It is built to the Russian gage of 5 feet, as the line is the natural continuation of the great Siberian Railroad. The car is kept as low as possible, partly to save weight, but chiefly on account of the small stature of the Chinese laborers. The woodwork will be made on the spot; the ironwork for 400 of these cars, of which 100 will be with brakes and the rest without, has been ordered from the Beaume & Marpent Co., Belgium.

The car is of simple but strong construction; the main frames and buffer beams are 11 in. × 4.7 in. section, strongly reinforced by crosspieces and diagonals, the whole tied together by ⅞-in. bolts, thickened to 1⅛ in. at the screwed ends. In consideration of the rough character of the temporary lines over which these cars will have to run, and of the small facilities for other than the simplest repairs, the use of cast iron has been avoided as far as possible.

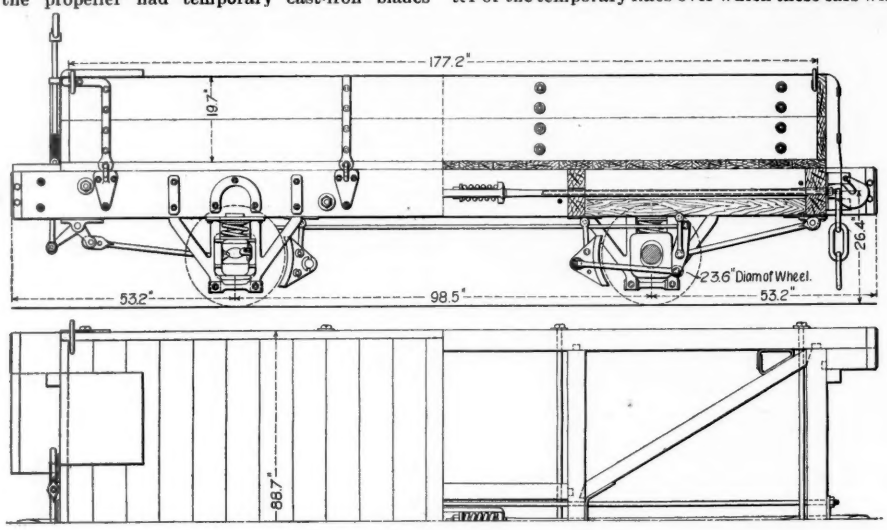


Fig. 1.—Spoil Car—Eastern Chinese Railroad.

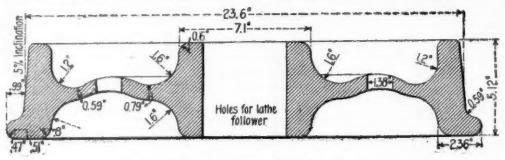


Fig. 3.—Cast-Steel Wheel.

The following points in the specification for materials merit attention: All tensile tests, save for cast iron, must be made on a standard bar 16 mm. (0.63 in.) in diameter and 200 mm. (7.88 in.) long between marks, on which length the elongation is measured. For sections not admitting the use of a test bar of these dimensions, a flat bar of a section not less than 2.5 sq. cm. (0.388 sq. in.) is allowed, or if this is impossible, a round bar of not less than 12 mm. (0.47 in.) in diameter. The length between marks on which the elongation is measured must, in these cases, be such that its value in centimeters is 10 times the cross-section of the bar in square centimeters. The product of the tensile strength, calculated on the original section, by the elongation between marks constitutes the "figure of quality" of the material; tensile strength and elongation may vary inside of the limits defined by the minimum of each and of the figure of quality which are prescribed in each case.

The following summary gives the qualities required of each material used. The figures are the minima allowed in each case:

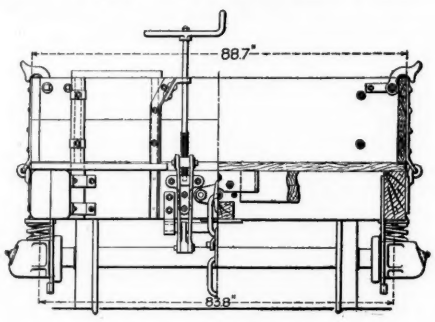


Fig 2.—Spoil Car—Eastern Chinese Railroad.

Material.	Tensile strength.		Elongation.	Figure of quality (for kilos. per sq. mm.).
	Kilos. per square mm.	Lbs. per square in.		
Wrought iron	35	49,800	20%	800
Wrought steel	50	71,100	20%	1,000
Spring steel	75	106,500	10%	1,000
Steel castings	45	64,000	15%	800

N. B.—"Wrought iron" may be either puddled or ingot iron, at option of maker.

Cast iron must have a tenacity of at least 8,450 lbs. per square inch, and a rough bar 1.18 in. square in cross-section, placed on bearings 39.4 in. apart, must bear a load in its middle of 991 lbs. before breaking.

Fig. 3 illustrates the cast-steel wheel used. The rim is of sufficient thickness to allow of a single turning when worn hollow, after which it is intended to remove the flange and shrink on a tire. The axles are very robust; the journals measure 3.54 in. × 6.7 in. The axle-box and horn plate are shown in Figs. 4 and 5 and call for no special remark.

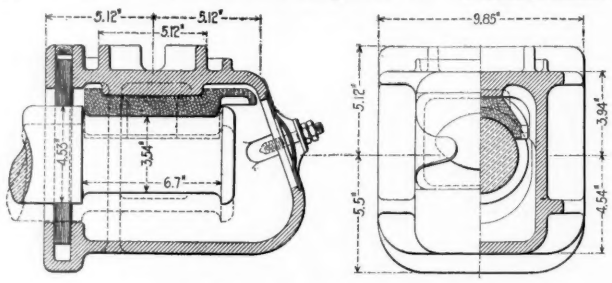


Fig. 4.—Axle Box—Manchurian Railroad.

Figs. 6 and 7 show the drawbar and yoke containing

the spring; the assembled parts are required to resist without permanent set a test load of 26,400 lbs. acting for a quarter of an hour.

The brake is worked by a screw, as usual in European rolling stock, and is therefore very powerful. The brakebeam is shown by Fig. 8. This style of beam, made of round or square iron, is universal in Europe, where it has almost entirely weeded out other styles of composite beams and those composed of a number of small parts. These beams are usually welded together by hand, the corners being finished in dies under the steam hammer or press, which makes a very clean, solid job. The beams here in question are required to bear a test load of 13,200 lbs. without permanent set, the bearings being spaced 61.6 in. apart.

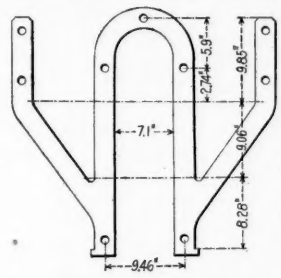


Fig. 5.—Horn Plate.

The car has a capacity of 18,000 lbs.; the weight of those fitted with brake will be about 4,500 lbs., those without brake being about 600 lbs. lighter. As shown in the drawings, the body is supported on eight helical springs placed directly over the axle boxes, formed to receive them. The outer springs carry the empty body, the heavier inner ones coming into play as the load is thrown on. The bearing plate, bolted on to the sills, is of cast steel.

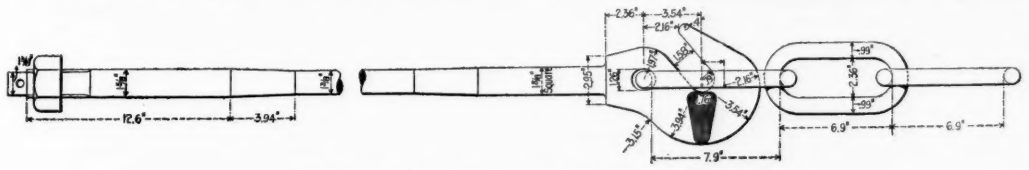


Fig. 6.—Half Drawbar with Chain—Manchurian Railroad

Twelve engines have at present been ordered from the Hanover Locomotive Works (successors to G. Egestorff) for the construction of the line. These are six-coupled tank engines for wood fuel, with 15.75 in. × 21.6 in. cylinders and driving wheels 46.5 in. in diameter, and will weigh about 80,000 lbs. in working order.

The Effect of Brakebeam Hanging Upon Brake Efficiency.*

BY R. A. PARKE.

Surrounded, as it is, by dynamical conditions which are in themselves very complicated, and which are only partially understood, it is not surprising that a systematic analysis of the design and action of brake gear has been neglected; but the complexities are not too great

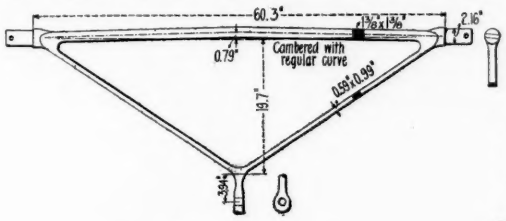


Fig. 8.—Brakebeam.

to permit a sufficiently satisfactory analysis to be made, and the prospective benefits to be derived from the information thereby obtained appear to reward the tiresome work which such an analysis has involved. That such an analysis has afforded the clue to such a simple modification of the present mode of suspending brake beams *as will enable trains to be stopped thereby in from 10 to 15 per cent. shorter distance*, sufficiently

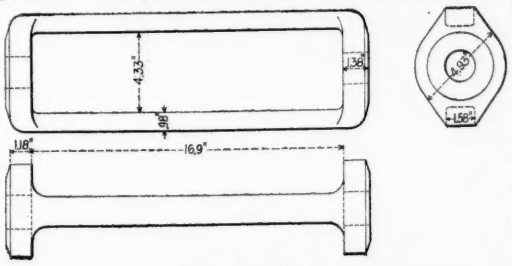


Fig. 7.—Draw Yoke.

attests the value of attacking dynamical problems through the methods of theoretical mechanics.

We must first understand what results from applying brakes. The stopping of the car is only what *indirectly* results. The effect of applying the brakes to the wheels of the car is not directly the means of stopping the motion of the car; the mere stopping of the rotation of the wheels has nothing to do with altering the speed of the car, if no other forces are thereby introduced than would occur under the supposition that the car is not in contact with the rails. We also perceive that the only direct function of the brakes as applied to the wheels of the car is to check their tendency to continued rotation. This, and this only, is the immediate effect of applying the brakes to the wheels of the car. The instant that any tendency toward sliding of the wheel upon the rail occurs frictional resistance, due to the pressure of the wheel upon the rail, immediately asserts itself and causes the wheels to persist in their rotation, notwithstanding the fact that the brakeshoes in rubbing upon the wheels offer a resistance to their continued rotation.

It should be plain that what actually retards the motion of the car is the frictional resistance of the rail upon each wheel, which is initiated whenever any force acts upon the wheels to cause them to lag in their continued rotation. It is to be remembered also that the force exerted by the rail upon the wheel to cause its persistent rotation is only of such degree as is necessary at any time to overcome the resistance to the rotation of the wheel. When the brakes are not applied the frictional force applied to the wheel by the rail is only sufficient to preserve rotation against the comparatively small resistance of the friction at the journal. It is easy to see that the frictional force exerted by the rail upon the wheel, which retards the motion of the car, is *measured* by the resistance which the brakeshoe friction offers to the continued rotation of the wheels. The brakes have, however, no other power to stop the train than to call into effective existence a force between the rail and the lowermost point of each wheel, which, while causing persistent rotation of the wheel, is also a force opposed to the motion of the car, which ultimately brings the car to a stop.

The tendency of the frictional resistance applied by the rails to the wheels, when the brakes are applied, is to overturn the car body about an axis of rotation which is situated at the center plate upon the forward truck, and also to overturn each truck about an axis of rotation situated at the point of contact between the forward pair of wheels and the rails.

Conditions which commonly prevail in practice may be separated under two distinct heads. One consists of all cases in which the brakebeams are suspended directly from the trucks; the other consists of the case in which the brakebeams are suspended directly from the car body. These cases we will consider separately.

Fig. 1 represents the body of a car in motion, where the brakebeams are suspended from the trucks. By introducing the forces which are applied to the car body by all external objects with which it is in contact, we have all the conditions of a free body, the motion of which may now be conveniently studied. Each of the forces is represented by an arrow, as is also the direction of motion of the car. There are, or may be, six different forces directly applied to the car body by connected objects, during an application of the brakes. They are, respectively a forward pull upon the drawbar at the forward end of the car, represented by D_1; a backward pull (which may also be a forward push) upon the drawbar at the rear end of the car, designated by D_2; an upward supporting pressure, P_1, from the forward truck, at the forward center plate, which is, of course, equal to the portion of weight of the body supported by that truck; an upward supporting pressure, P_2, from the rear truck, which is likewise equal to the portion of the weight of the car body carried upon that truck. The two additional forces applied directly to the car body by external bodies are those marked H, each being a horizontal retarding force applied respectively by the forward and rear trucks at the forward and rear center plates. The two forces H will be regarded as invariably equal during an application of the brakes, for the reason that the retarding forces resulting from the application of the brakes to the two trucks should always be equal.

In addition to the forces directly applied by other bodies which are, or may be, in contact with the car body, there is always the additional force of gravitation represented by W_1.

Another force acting through the center of gravity of the car body, is designated by E. It is with this force E that we have chiefly to deal in considering the difference in the magnitude of the forces P_1 and P_2. The sum of the forces of inertia, which tend to maintain the velocity of existing motion in all the particles, is equivalent to a single force acting through the center of gravity (E). When the brakes are applied, and the two forces H are thereby applied by the trucks to the car body, the imaginary force E is immediately called into existence, whereby the car body tends to continue its movement in spite of the resisting forces applied to it.

In Fig. 1 it is seen that all the retarding forces are applied to the car body at a point considerably below its center of gravity. The resultant of this system of retarding forces must be equal, and opposite in direction to the force E, and, being applied below the center of gravity of the car body, it is an eccentric force resisting the forward motion of the car body. It therefore, tends both to cause a retardation of the motion of the car body and to cause the car body to rotate about the forward center plate at P_1. The result is that the portion of weight carried upon the rear truck is diminished, and there is a corresponding increase in the weight carried upon the forward truck.

Such being the fact, it is unquestionable that a less pressure of the brakeshoes must be exerted upon the wheels of the rear truck than could be exerted upon the corresponding wheels of the forward truck, to prevent wheel sliding at the rear truck. The greatest brakeshoe pressure which can be applied to the wheels, without causing them to slide upon the rails, is thus limited by the pressure of the wheels of the rear truck upon the rails, and no further consideration whatsoever need be given to the forward truck. What we have now to consider alone are the conditions existing upon the rear truck.

Fig. 2 represents the rear truck of the car under consideration. Here again it will be seen, as in the case of the car body, that the forces T_1 and T_2, resisting the forward motion of the truck, are applied at the lowermost points of the structure, while the forces urging the truck forward are, first, the force I, due to inertia, applied at the center of gravity of the truck, and, second, the force H, applied at the center plate, far above the center of gravity. This condition inevitably results in a reduction of the normal pressure of the rear pair of wheels upon the rails, and in a corresponding increase in the pressure of the forward pair of wheels upon the rails.

We finally reach the primary object of this discussion, which, briefly stated, is a realization of the facts that, during any application of the brakes, the rear truck carries the least weight, and in any case where the brakebeams are suspended from the truck, the rear pair of wheels of the rear truck exerts a less pressure upon the rails than any other pair of wheels upon the car.

If this fact is now clearly understood, it will be equally clear that, in order to prevent wheel sliding, a uniform *brakeshoe pressure* upon each pair of wheels

Fig. 1

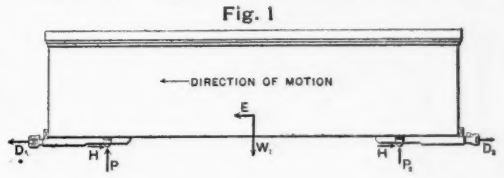


Fig. 2

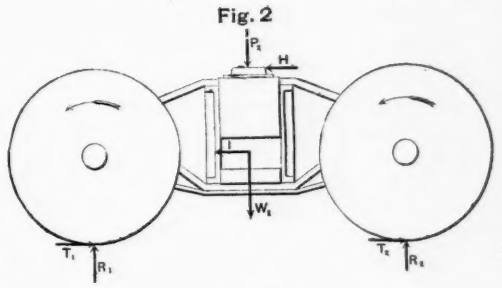


Fig. 3

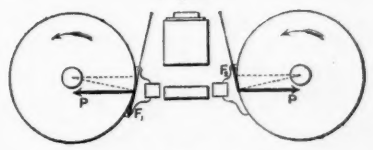
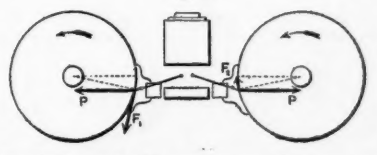


Fig. 4



must be limited to what is safe upon the rear pair of wheels of the rear truck.

It is a clearly established fact, therefore, that the customary method of organizing brake gear so that the same pressure of the brakeshoes shall be applied to each pair of wheels, necessitates the reduction of that brakeshoe pressure to within the safe limit for the rear pair of wheels. Certain apparent inconsistencies in air-brake practice may be explained in part through this condition of things. Such seeming inconsistencies include the fact that it has been customary in the past to use a calculated braking power of only 70 per cent. of the weight of freight cars, while the custom has been to use a calculated braking power of 90 per cent. upon passenger cars. A greater reduction in the portion of car body weight carried by the rear truck occurs with short freight cars than with long passenger cars. Also a greater transfer of weight from the rear pair to the forward pair of wheels occurs with the short wheelbase of freight car trucks than occurs with the longer wheelbase of passenger car trucks. These two facts combine to reduce the safe brakeshoe pressure upon freight car wheels more in proportion than upon passenger car wheels. It is true that other important influences bear upon this question, and these other features may profitably be considered.

A material reason why a 70 per cent. braking power is best adapted to freight service, while a 90 per cent. brak

(*Continued on page* 818.)

* Extracts from a paper presented at the November meeting of the New York Railroad Club.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We give in this issue the statistics of freight-car couplers and air-brakes which the railroads will have to lay before the Interstate Commerce Commission when they appear on the first of next month to ask for more time in which to finish the equipment of their cars. It seems clear that *all* the railroads must join in a united request for a short extension of time, for every road does a large share of its business in borrowed cars, and must do so. The law permitting it to refuse others' cars is not of the slightest benefit, except perhaps in isolated, unimportant cases. For the Commission to be strict with one road and lenient with another, as the newspaper correspondents have guessed that it would do, would simply place a great embargo on commerce and would not punish the guilty any more than the innocent. As far as air-brakes and engine-brakes go, the law has been virtually complied with, except in the case of driver brakes on a number of minor roads and on a few larger ones. With 40 per cent. of the freight cars equipped with air, or even 30, nearly all trains can be run according to the law. Whatever exceptions may be applied for can probably be very reasonably granted, for the value of the air-brake is now pretty well appreciated on every railroad. The only serious question before the Commissioners is that of couplers. With only 55 or 60 per cent. of the cars of the country equipped, they will, no doubt, think it their duty to do something to hasten matters. With some companies a little pressure would evidently be salutary. In the case of old cars, which, while still fit for considerable service, are not worth the expenditure of $75 or $100 to put new couplers on them, there seems to be no reasonable solution but to let the railroads continue in the course they are already pursuing. To comply with the exact letter of the law in this respect is simply a great waste of money with no tangible benefit. The cars must soon be destroyed in any event and the time and money that would have to be spent on them had better be spent in building new cars. A single year of active business will make apparent a decided shortage of freight cars everywhere. The need of using cars of much greater capacity, to meet the competition of rival carriers, is now a serious fact in the experience of every road, so that the construction of new cars is an urgent necessity. For bulk freight, especially coal and iron ore, large capacity now means not 20 tons, nor 25, but 30, 35 or 40, so that many roads are now anxious to get rid, as soon as possible, of cars carrying as much as 20 tons each. Fortunately, old cars, with old-style couplers, can, in the coal and ore traffic, be run largely in trains by themselves.

Whether many roads can and will make extensive use of old cars in exclusively intrastate traffic is a question. It looks as though a good many small roads intended to claim exemption from the operation of the law on the ground of being wholly within one state, though some of these are in states which have passed laws practically the same as the Federal law. In such cases poverty will probably be the plea at home, if any is needed. As far as the Federal law is concerned, there would seem to be no trouble in running cars which do not comply with it (if they are not subject to it) in the same train with those which do comply. In the matter of brakes, to run a *train* without sufficient cars power-braked to enable the engineman to control the speed is a violation, and a single car of interstate freight in the train would make the whole train subject to the law; but, as we have already observed, compliance with the brake law will not be hard to manage. The clause concerning couplers, however, refers to *cars* (not trains) "used in moving interstate traffic." A car in the forward part of a train is "used in moving" those in the rear part, but it is reasonable to assume that the law means "used in carrying" interstate freight, so that any car not carrying such freight is clearly exempt.

Last Saturday a special dispatch reached New York saying that a trial of the Heilmann locomotive had been made on the Western Railroad of France the day before; that a run was made from Paris to Nantes (269 miles) with a train weighing 200 tons (which must be the weight behind the tender, as the locomotive itself weighs about 123 tons); that a speed of 18 miles an hour was maintained; that the trial was especially to demonstrate the freedom from vibration of this machine; that everything was very satisfactory, and finally, that "the directors have decided to adopt the Heilmann locomotives." We suppose that every reader of the *Railroad Gazette* who has any interest in this matter knows too much to accept for a moment the statement that the directors of the Western Railroad of France or any other great railroad will adopt the Heilmann locomotive unless it might be for some very peculiar service. The locomotive mentioned in this cable dispatch is doubtless the new Heilmann locomotive built within a year, and which is modified considerably from the "Fusée" (Rocket) of two or three years ago. It embodies, however, all the essential principles of the earlier Heilmann locomotive. This new engine was described, with illustrations, in the *Railroad Gazette* of April 21, 1895. It is a central station and an electric locomotive combined. On 16 driving wheels (8-coupled at either end) are carried an ordinary locomotive boiler with a Belpaire firebox, and an upright steam engine of from 1,300 to 1,400 H. P. with six cylinders, also two generators and an exciter, and, finally, an electric motor on each one of the eight axles. It goes without saying that such a machine can develop and can sustain great power and speed; but, on the other hand, it also goes without saying that it is an extremely costly, cumbersome and unmechanical way of hauling trains over the face of the earth. This aspect of the subject we discussed at considerable length when the earlier Heilmann locomotive was attracting attention, namely, Nov. 9, 1894, and that discussion was summed up in the following sentence: "Theoretically, it is wrong; practically, it is too heavy and complicated." We see no reason for changing that opinion now.

The Chronicle's reports of gross earnings for the month of October show a gain of 8.97 per cent. over the same month last year. In September the gain was 14.14 per cent. The October gain is in face of the falling off in the grain movement and also shows something of the effect of the yellow fever quarantine in the South. In the West the livestock and provision movements were less than in September and consequently the gains of October are ascribed largely to increased movement of merchandise and miscellaneous freight. The greatest gain is shown by the Canadian Pacific, namely, $662,000; the Missouri Pacific has almost half a million, the Great Northern over a quarter of a million, the Wabash $211,000, the Northern Pacific $196,000. The decreases on the Southern roads are not as large as might have been supposed. The Alabama, New Orleans, Texas & Pacific loses about $84,000, or 30 per cent.; the Louisville & Nashville loses $60,000, or only 3 per cent; the Kansas City, Memphis & Birmingham, $35,000; while the Southern shows an actual gain of $17,000, less than 1 per cent. to be sure, but still a gain. The Texas & Pacific gained $51,000 and the Mobile & Ohio lost only $22,000, or 5½ per cent.

Handling Freight Trains Partially Equipped with Air.

Since Mr. Nichols presented his remarkable paper on handling freight trains partially equipped with air before the Central Association of Railroad Officers at their July meeting, much has been said and written on this subject. Some railroad superintendents have tried Mr. Nichols' rules and others are taking steps to do so. In view of the fact that these rules are so decidedly at variance with those promulgated by such representative bodies as the Master Car Builders', Master Mechanics' and Air Brake Men's Associations, which are also endorsed by the Westinghouse Air Brake Company, it is certainly worth the time to investigate the subject carefully before drawing conclusions, which may lead to a step backward. That the rules have worked well on Mr. Nichols' division is not in itself sufficient to guarantee their successful application on other roads. Whether it is the "personal element" on the Chicago, Rock Island & Pacific, which under the master's eye could make any of his rules work out well, or whether the rules have not yet been put to the crucial test of extreme conditions, the fact remains, that frequently the experience on one road is exactly the reverse of that on another.

The Master Car Builders' Association has now a committee at work on the subject of trains parting, and when they make their report at the annual convention next year much additiona light may be expected on the subject of handling freight trains so as to reduce the danger of breaking in two. A large percentage of such accidents is undoubtedly due to the faulty handling of the brakes. Mr. Nichols' rules, however, seem to aim, not so much at avoiding the break-in-twos, as to reduce the damage generally accompanying them.

The two foundation rules upon which his practice is based—1st, to always consider the train as broken in two when approaching a stop, and, 2d, to control the slack before it gets dangerous—are as sound as safe, and every railroad company might take them as a foundation upon which to build up its system of instructions for the use of those handling freight trains. But instead of applying these rules to the brakemen, as Mr. Nichols does, and thus entrusting to them the control of the movements of the train, why not apply them to the engineman in the first place, and to the brakemen only when it would be necessary to assist the engineman at his call? The average locomotive engineer is a man of a higher intellectual level than the general run of brakemen, and on account of his mechanical training and his familiarity with the resources at his hand, he is more fit to be entrusted with the guidance of a train than any other man on board. To relieve him of the responsibility or to divide it by subordinating him to others in handling the train, will merely serve to harrass him and to disturb the confidence in himself and in the powerful agent under his hand, which, after all, is the final safeguard of the train. He sees the road before him with its curves and its grades, stations and signals; he can accelerate or retard the speed with a touch of his hand; he can pipe the train crew on deck with his whistle if he needs them; he alone knows when an emergency is at hand, when quick decision and quick action are necessary, and when he is justified in breaking up a thousand dollars worth of property, if need be, to save other thousands.

This last privilege, to assume absolute control of the train in emergencies, Mr. Nichols does not deny to his enginemen, but ordinarily they are to sit quietly in their cabs and mind their own business, and when they approach a station they are to watch for the brakemen manipulating a few wheels at the rear, and then they are to apply enough air to retard the engine and tender, but not quite enough to stop them, for all the cars must be held back before the engine is, in order to keep the slack stretched. Mr. Nichols has, however, left to the engineer the right to call off the hand brakes, and it is to be presumed that this operation will be executed in the reverse order of applying them, so that the brakemen will work their way back toward the caboose, thus allowing the cars to push up against the engine when a sufficient number of brakes has been released.

This manipulation of the hand brakes in making a stop is, in fact, a test or inspection to detect whether or not the train is broken before the engineer makes his application of the air brakes. In case there should be a break between two non-air-brake cars toward the rear end, the detached portion of the train would certainly be saved, but the engineer may not immediately discover the parting, and, trusting to the hand brakes at the rear end to slow up the train, it may finally be too late to stop the forward section from running into a derail or an obstruction.

If the engineer, instead, were depending on his own resources he would merely shut off the steam in good time, and allow the engine (which on account of the resistance of the pistons in the cylinders will slow up sooner than the cars), to gradually gather up the cars behind it, whether their couplings are intact or not, until the train is as compact as a solid body, after which even an emergency stop would not do much damage. If the cars have separated several car lengths at the point of fracture, and he discovers

it, he will whistle for brakes simultaneously with shutting off his throttle, and unless he has distance enough to keep out of the way or to gather up the detached cars as they creep up, he must trust to the men in the rear to take care of themselves and their charge.

Here is where Mr. Nichols' first fundamental rule should be applied: The engineer should consider the train as broken in two until it has closed in upon him and he sees the markers on the caboose in their right place.

When approaching a regular stopping place the trainmen should get up and inspect the train exactly the same as under Mr. Nichols' rules, except that they should not set any brakes unless they discover a gap in the train. This rule, if observed, would enable the engineer to control everything attached to the engine, but any detached parts would be under control of their respective brakes. What is more, in case a break should occur between two air-brake cars while approaching a station Mr. Nichols' practice would probably aggravate the evil by separating the cars, while the present practice of shutting off the steam and putting the air-brake valve on lap would close up the gap before any serious damage could be done.

We doubt if we clearly understand the purpose of that part of Mr. Nichols' paper which relates to cutting out air brakes in good working order in trains of less than half air-brake cars, in order to make the air-brake cars thus cut out available for hand brakes, and thereby get sufficient power to control the train by the hand brakes. The paper makes it appear as if Mr. Nichols had scarcely sufficient faith in the air brake and the enginman to trust them in assisting the brakemen while they manage the train under his rules. Yet the slack between the air-brake cars, even when they are coupled with link and pin, is not so very troublesome and takes pretty good care of itself, because the braking power is distributed over and acts on all the wheels of the air-brake cars simultaneously. What does Mr. Nichols do with the slack on a fully equipped air-brake train, and why does he not try to stretch it, too, by hand brakes at the rear?

The second use for brakes, that of holding trains down grades, will now be considered. Mr. Nichols' men in the caboose must be on the alert for the grade, and must begin to apply their brakes before the engineman can shut off steam and begin to slack. If the rear brakes are not on when the throttle is closed, the slack will commence to run in on the engine; to begin to stretch the train then, sufficiently to hold it back on the grade, would mean a sharp jerk at the front end, with the danger of breaking in two.

After the train has begun to glide down the grade, stretched out to its full length, an emergency stop would probably cause a great deal of damage. Even a bursted air hose at the front end may transfer the greatest braking power from the rear to the front end in a violent manner. After having reached the foot of the grade, the engineman must whistle "off brakes" before he can release the air and pull ahead. Now, if the grade terminates in a sag, the cars will run up against the engine the moment the hand brakes are released, before the engineman can make any headway up the ascending grade. Here are exactly the conditions which Mr. Nichols describes and aims to avoid. "We all know," says Mr. Nichols, "that it is due to the head end slowing up by reason of the grade, and the slack between the cars giving a cumulative force to the rear cars." With the old plan, or the plan now in general use, there would be no slack to furnish the cumulative force, as the train would have descended closed up. The engineer would merely release the brakes at the foot of the grade, and let the momentum start the train up the new grade until it had begun to spend itself, when a little steam would again stretch out the train for the ascent.

Continuing with the conditions described by Mr. Nichols, the grade up which the train is now pulling may terminate in a knoll with another down grade beyond. In order to keep Mr. Nichols' "demon of slack from cutting down the Rock Island dividends," the engineer needs but to shut off steam at the proper point after his engine has passed the summit, and as the air-brake cars begin to descend after him a little air will gather them up behind him. The non-air-brake cars in the rear are still stretched out on the ascending grade, but if he has timed his brake application right, they will have sufficient momentum to take the summit and line up gently one by one behind the air-brake cars, until the train is again bunched solid for the descent.

If we understand Mr. Nichols' methods correctly, the rear cars would be braked before they reached the summit. This may require steam to pull them up, and as they scale the ridge they will pitch forward unless more brakes be applied before the engineer shuts off. It seems that this arrangement of clearing a hill throws an extra strain on the couplings, and if the train should snap in two between non-air-brake cars in front of those braked, before the steam is shut off and the air brakes are in use, there would certainly be a catastrophe.

We do not wish to criticise Mr. Nichols' rules, except so far as their claimed superiority over the rules of the Air-Brake Men's Association is concerned. He has made a brave attempt to improve the handling of freight trains on his division, but is it not possible that the good results he obtained are due to an improvement in the personel rather than in the rules?

The Emergency Brake and the Garrison Accident.

One feature of the Garrison accident which seems to be of very great interest we have not seen commented upon, that is the relations of the brakes to what happened, and more especially to what did not happen. We take it that this accident gave us a useful illustration of the value of the emergency, quick-action brake as a means of saving life. The quick, serial application of the air-brake is necessary to its use in freight service; it is a fundamental condition. This feature of the quick-action brake is of far less importance in the short passenger trains. But while the increased power in emergency application is important in freight service, it is of paramount importance in fast passenger service. This last is the braking lesson of the Garrison accident. It is most fortunate that the train was equipped with the emergency, quick-action brake, and no one can estimate the increased number who would have perished if its influence had been absent.

Over and over again we have the lesson in passenger train accidents that it is the last 25 or 50 feet run that kills. One of the clearest of these lessons was the famous Quincey accident in 1890 when 23 persons were killed, and none would have been killed if the train had been stopped 45 feet sooner, and it would have been so stopped if the brakes had been up to the best standards of the time. Now we have a case of lives saved by a quick stop with good brakes. But we want especially to draw attention to the fact that it was not only the quick application, but the increased power of the emergency application that saved the lives in the rear cars.

The train consisted of a locomotive and ten cars, six of which were sleepers. All of the cars were fitted with quick-action air-brakes on all the wheels. The train was running at not less than 40 miles an hour, and, as the tangent at the spot is favorable to fast running, it is probable that the speed at the instant of the accident was not less than 45 miles an hour. Without any warning, the locomotive left the track and plunged into the river. The condition in which the locomotive apparatus was found when it was recovered from the river leaves little doubt that the engineman had not sufficient warning to enable him to perform any act whatever for the protection of the train. The throttle was shut, but the engine was not reversed, and the brake valve was in the running position. It is probable in a high degree that the emergency application of the air-brakes, observed throughout the train by the train crew and passengers, was automatic and resulted from the separation of the air-brake couplings as the engine left the train and plunged forward into the river.

This application of the brakes had, of course, no effect in reducing the speed of the locomotive, which was found considerably further down the river than any of the cars except the express car, next behind the locomotive, which floated off down the river. Each succeeding car left the track at a lower speed than the one before it, until finally the third sleeper (the seventh car of the train) merely toppled over on its side in the river without very serious damage to the occupants, and the last three sleepers were left standing on the track.

Here was a ten-car train, running at a probable speed of 45 miles an hour, to which the quick-action brakes were applied after the locomotive had left the track, and which was brought to a full stop in less than seven car lengths, notwithstanding the probable tendency of the front cars to drag the rest of the train along with them.

What would have happened if this train had not been equipped with the emergency, quick-action brake, it is impossible to compute. It has long since been demonstrated that it is impracticable, on account of wheel sliding, to employ as great a retarding action of the brakes in the ordinary operations of regular service as is required for the reasonable protection of life. The emergency, quick-action brake, while restricting the force of the brakes so that no injury to the wheels shall occur in service applications, causes a 20 per cent. more powerful retarding force to be utilized in emergencies, through discharging air directly from the train pipe into the brake cylinders. If this emergency feature had not been present in the brake apparatus upon the New York Central train, it is certain that the speed of each successive car as it left the rails would have been materially greater than it actually was, and it is most probable that more of the cars, and very likely all of them, would have gone into the river. How many additional lives would thus have been lost, no one can tell; but it is fortunate beyond estimation that the train was equipped with this most efficient emergency feature of the quick-action air-brake, instead of with the earlier forms which furnish no greater stopping power in emergencies than can be safely used in ordinary service operation.

Annual Reports.

Baltimore & Ohio.—The seventy-first annual report of the Baltimore & Ohio Railroad Co. is for the year ending June 30, 1897. We find that the gross earnings were $25,582,000, an increase of a little more than a million and a half as compared with the preceding year and of 2¾ millions as compared with 1895. The increase in freight earnings was almost exactly a million and a half. The decrease in passenger earnings was about one-quarter of a million and the increase in miscellaneous about one-third of a million.

The operating expenses were a little more than 20 millions, the increase having been $2,429,000 as compared with the preceding year and $4,200,000 as compared with 1895. This increase was in all of the items, namely, half a million in conducting transportation, half a million in maintenance of equipment and $1,215,000 in maintenance of way and structures. The net earnings from operation amounted to $5,570,000, being a decrease of over three-quarters of a million. The net available income was a little more than 6½ millions, about three-quarters of a million less than in the preceding year. Having paid interest, rentals, taxes and other charges to the amount of $7,771,000 there was a deficit in the year of $1,177,000.

The maintenance of way expenditures amounted in gross to $4,134,000, an increase of 41.6 per cent. This was due to heavy charges for rebuilding old bridges and for such other work as arching tunnels and putting in more than the normal amount of new rails, ties and ballast. For instance, the entire Washington Branch was relaid with new rails and the ties were largely renewed and a large amount of stone ballasting put in, the result of which is that whereas the net earnings from this branch in 1896 were about $100,000, in 1897 they were only $16,755. Practically the whole net earnings of the branch went into betterments. The expenditures for maintenance of equipment also were very heavy, namely $3,522,000, or half a million more than in the preceding year and almost 1¼ millions more than in 1895. All of the cars and engines which could profitably be repaired have been put into good condition. Aside from all this $1,895,497 has been spent for construction and betterments within the year and charged to various investment accounts. Recent articles in the *Railroad Gazette* have shown the reader where some of this money has been spent.

The tons of freight carried in 1897 amounted to 18,717,000, an increase of 854,728 tons. The ton miles were 3,499,075,760, the increase having amounted to about 663 million ton-miles, or 23 per cent. The average distance that each ton was carried increased 28.16 per cent. and reached 186.95 miles. The ton-mile rate fell to 0.524 cent The passengers and the passenger miles both fell off, as did also the rate slightly. The total passenger miles amounted to 289,619,275, the decrease having been 2½ per cent. and the passenger mile rate was 1.747 cents, a decrease of 0.038 cent from the preceding year.

The General Manager's report gives in great detail the items of work done in improvements of way and structure, which it is worth while for anybody interested in the property to look over pretty carefully. We find that 578 miles of road was ballasted, 4,393 cu. yds. of masonry built, 44 bridges and culverts erected and 558 repaired and strengthened. The table of new steel rails shows an aggregate of 25,205 tons, valued at $707,252. The title of this table does not, however, state explicitly that this rail was all laid in the year. In the same table the number of cross ties given is 1,624,000, the value having been about $613,000.

The President simply reports facts and makes no forecast of the prospects of the property.

The Supreme Court of New Jersey has set aside the conviction, in the Mercer County Court, of the Philadelphia & Reading Railroad, for maintaining a nuisance in the shape of an unprotected crossing in Ewing township The court below had held that the railroad company must take into consideration the conditions which make a crossing dangerous and protect it accordingly. Counsel for the railroad company contended that the company could only be compelled to take such precation as the statute provided, that is, blow the whistle and ring the bell. The opinion of the court is that "a railroad company can be required to give such signals of the approach of trains as the legislature has prescribed, unless the crossing has some particularly dangerous feature

occasioned by the company itself in constructing its road or buildings." Press dispatches say that the significance of this decision in New Jersey is that only where municipalities by their charters have been authorized to regulate the speed of trains and the protection of crossings can railroads be compelled to do more than ring the bell or blow the whistle if they have not themselves made the crossing dangerous in the way specified. For townships in first-class counties, a law was passed two years ago, giving specific powers, but the smaller places are now bewailing what they look upon as their complete subserviency to the railroads. They evidently assume that each railroad company desires to make its crossings as dangerous as possible, and that the townspeople will be in constant danger until a new law can be passed. It seems to us that these towns are unduly alarmed. The Supreme Court decision, as reported, undoubtedly bears on the railroads much harder than has been assumed. If a railroad makes a crossing dangerous by obstructing the view, as in putting up a building, it may just as clearly make it dangerous by increasing the speed of its trains; and in most cases it is likely that a large increase in the frequency of trains would be held to be productive of increased danger. If the New Jersey Supreme Court has not gone into the question to this extent it is pretty sure to do so if the argument is kept before it with sufficient persistency. Surely, a crossing created under the conditions existing when the New Jersey law was passed (1852) is not to be considered in the same light when, as in the case of many crossings now, trains run over it every day at 60 or 70 miles an hour.

The Supreme Court of New Jersey has decided the street-crossing case of the Erie Railroad against the city of Newark in favor of the railroad company. The city opened a street across the tracks. The company was awarded] in the lower courts $250 for the expense of planking, but wanted to be allowed for the expense of erecting and maintaining gates also. This the lower court would not allow, ruling out all evidence on these points. This ruling is overthrown by the Supreme Court, and it is held that compensation must include all moneys which the act causes the company to pay out; and that the erection and maintenance of gates is an added expense which the company is entitled to ask compensation for. The decision is declared to be so sweeping that every municipality laying out new streets which cross a railroad track at grade must not only pay the railroad for the right of way, but must maintain gates and gatemen there in perpetuity. In most cases, says the Associated Press reporter, this would prevent forever the opening of streets and new towns. Towns which are extending their settled districts will find themselves in serious embarrassment. The city will carry the case to the Court of Appeals. The city officers of Newark are said to be appalled at the decision, as the city will "within a few years find it necessary to open new streets through a section which is all cut up with railroads." It seems to us that if the city officers are so easily "appalled" at the prospect that they must lay out their new streets where travel on them can be made safe, they must be the exact opposite of people in general. Most intelligent citizens are appalled at the sight of grade crossings, rather than at seeing successful efforts to prevent their extension. Where a tract is "all cut up" with streets a new railroad has to stand back; no one would think of permitting it to invade such a place, unless it went above or below grade; and of course the same rule should hold when the conditions are reversed. Those city officials must have "stuffed" that reporter.

The State Railroad Commissioners of Massachusetts have given authority to an electric street railroad company in East Bridgwater, for a term of five years, to cross, at grade, the tracks of the New York, New Haven & Hartford. As the policy of the state of Massachusetts contemplates severe restriction of grade crossing privileges and discountenances the establishment of new crossings, there has been some little newspaper criticism of this and other decisions of the Commissioners which seem to relax the restrictions; but in point of fact the responsibility for everything that has been done in the shape of a new crossing or the extension of the privileges at an old one lies with the Legislature, and wherever the Commissioners have let down the bars it will be found that they have gone only as far as the Legislature required. In the present case the crossing was one which had long existed and on which a location for the street railroad track had been granted by the town authorities. The Commissioners stipulate that there shall be but one street railroad track crossing the railroad tracks, and the crossing is to be constructed in such manner, with frogs or other devices, as shall be satisfactory to the railroad company, or, if the parties do not agree in regard to it, in such manner as the Commissioners may prescribe. The street railroad company, at its own cost, must provide at the crossing during all such part of the day as the electric cars are run a competent and reliable man, to watch the running of trains and give proper signals to the motormen, and no car can cross the railroad track except as he shall direct. The five-year limit may be extended by lawful authority. When electric motors came into use the Commissioners at first absolutely refused to authorize street railroad companies to lay tracks across standard railroad tracks, but there were so many applications for such crossings that the Legislature was persuaded to modify the law so that at present the Commissioners are authorized and practically required to allow crossings of this kind, after examining the premises and making such operating rules as seem to be necessary to secure a reasonable degree of safety.

The State Railroad Commissioners of Missouri have been inspecting the stations of the Missouri Pacific Railroad, and, as they deem it important that station buildings should correspond with the character of the people who frequent them, they have to say concerning the station at Jefferson City, the following: "With one exception the passenger stations are commodious, clean and neat. That exception is at Jefferson City, where we, as well as every person who visits the state capital, see an old, out-of-date, ramshackled building that leaves a very bad impression on the traveling public as to the surroundings of the state capital. The officials are in an elegant position now to build a modern station, while labor and materials are so cheap, that will be ornamental as well as useful and in harmony with the surroundings of our state capital and in keeping with the character of the people who visit the same." Being in an elegant position, the road must, of course, put up an elegant station, which syllogism proves that the legislators who meet at Jefferson City biennially are elegant men. Evidently the railroad company forgot, and supplied Jefferson City with a building which ought to have gone to Blue Cut. Possibly, though, this building is a survival from former years when there were men at Jefferson City of as scaly character as those at Blue Cut, though differently masked. When the new station is built we can suggest a state capital where, on the Missouri Commissioners' theory, the old one will be very suitable.

The Effect of Brakebeam Hanging Upon Brake Efficiency.

(*Continued from page* 815.)

ing power is best adapted to passenger service, is the fact that the friction of cast-iron brakeshoes upon chilled cast-iron wheels in freight service is materially greater than the friction of the same brakeshoes upon steel tired wheels in passenger service.

Before entering into a general criticism of present truck brake gear construction, it is advantageous to consider what means there may be for avoiding the evil of applying the same brakeshoe pressure to each pair of wheels, whereby a portion of the available retarding force from the rails is sacrificed. In a communication to the *Railroad Gazette* of Oct. 24, 1890, it was pointed out that a variation in the angle at which the brakebeam hanger inclines to the tangent to the wheel at the center of the brakeshoe results in a variation in the pressure of the brakeshoes upon the wheels. The principal purpose of that investigation was to call attention to the fact that inefficiency, on the one hand, and wheel sliding, on the other hand, might thus be accounted for in cases where other reasons appear to be absent. It was also there pointed out that, in order to obtain a uniform pressure of the brakeshoes upon each pair of wheels, the brakebeam hangers must be practically parallel to the tangent drawn to the wheel at the center of the brakeshoe. At a meeting of the New England Railroad Club, in November, 1895, a discussion arose as to the propriety of increasing the calculated braking force upon freight cars, and the writer briefly drew attention to the objections which have been more fully explained in this paper. Prof. C. Frank Allen, of the Massachusetts Institute of Technology, who was present during the discussion, referred to the writer's communication to the *Railroad Gazette*, and suggested that the effect of angularity of the hanger, there set forth, might be employed to compensate for the transfer of rail pressure from the rear to the forward pair of wheels of the truck. A careful investigation has revealed the fact that, by a proper inclination of the brakebeam hangers, the brakeshoe pressure upon each pair of wheels may be fairly proportioned to the pressure of that pair of wheels upon the rails. The utilization of this principle will now be considered.

It is manifest that the rear pair of wheels, when the car is moving in one direction, becomes the forward pair of wheels when the car is moving in the other direction. It is, therefore, absolutely essential that any successful method employed for increasing the brakeshoe pressure upon a pair of wheels, when the car is moving in one direction, must decrease the brakeshoe pressure upon that pair of wheels when the car is moving in the other direction. This is precisely what results from a proper inclination of the brakebeam hangers.

Fig. 3 represents the action of the brakes upon each pair of wheels of a truck when the brake hangers have the direction of the tangent to the wheel at the center of the brakeshoe. The same pull P is applied to each brakebeam. The brakeshoes apply a downward frictional force F_1 to the forward pair of wheels and an upward frictional force F_2 to the rear pair of wheels. The center of the brakeshoe is shown to be at the intersection of these forces upon each pair of wheels, and lines representing the brake hangers are drawn tangent to the wheels at those points. It must be observed that, with whatever force F_1 the brakeshoes act downwardly upon the surface of the forward pair of wheels, the wheels react upwardly upon the brakeshoes, and this upward force is directly resisted by the brake hangers. There is thus a direct compression in the forward brake hangers equal to the frictional force F_1. In a similar manner it will readily be understood that the rear brake hangers are subjected to a tension which is equal to the frictional force F_2.

Let us now consider an exaggerated case of inclination of the brake hangers, such as is shown in Fig. 4. Each brakebeam is here subjected to the same pull P as in Fig. 3; but the fractional forces of the brakeshoes upon the two pairs of wheels are no longer equal, as they were in Fig. 3. When the brakeshoes have been brought into contact with the forward pair of wheels, the combination is something similar to a toggle-joint. The reacting upward friction of the wheels upon the brakeshoes tends to carry the brakeshoes upwardly, along with the surface of the wheels, and, on account of the nearly horizontal position of the hangers, there is a strong tendency to force the forward pair of wheels away from the center of the truck. This tendency is, of course, resisted by the truck frame, and thereby a powerful pressure occurs between the brakeshoes and the wheels, in addition to the pressure resulting from the pull P upon the brakebeam. In this way, the brakeshoe friction F_1 upon the forward pair of wheels of Fig. 4 is materially greater than is the case in Fig. 3, where the angle of the hanger is such that it exerts no influence to force the brakeshoes against the wheels.

The effect of the inclination of the hangers upon the friction of the rear pair of wheels of Fig. 4 is precisely the reverse of what it is in the case of the forward pair of wheels. The reacting downward friction of the wheels upon the rear brakeshoes has a strong tendency to carry the brakebeam downward, which, with such an inclination of the brake hangers, would swing the brakeshoes away from the wheels. The effect of the pull P upon the brakebeam is thus in part offset by the opposing tendency to draw the brakeshoes away from the wheels, and a much diminished frictional action of the brakeshoes upon the rear pair of wheels results.

It is thus seen that if the brake hangers are so adjusted that they have the same angular direction as the tangent drawn to the wheel at the center of the brakeshoe, as in Fig. 3, the frictional resistance offered by the brakeshoes to the rotation of the wheels will be the same upon each pair of wheels. If, however, the brake hangers be sufficiently inclined to the tangent at the center of the brakeshoe, the frictional resistance of the brakeshoes to the rotation of the forward pair of wheels will be increased, while the resistance to the rotation of the rear wheels will be merely nominal. It is not difficult to conceive that if the hanger be given a less inclination to the tangent, the increase of the brakeshoe pressure upon the forward pair of wheels and the reduction of the pressure upon the rear pair of wheels will not be so great; or, going one step further, that we may, by selecting a suitable angle of inclination of the brake hangers, proportion the frictional forces F_1 and F_2 in almost any way desired. If, therefore, we can ascertain the extent to which the forward pair of wheels of the rear truck presses more heavily upon the rails in an emergency application of the brakes, than does the rear pair, we may be able to determine such an angle of the brake hangers that the brakeshoe pressure upon the forward pair of wheels shall be correspondingly greater than that upon the rear wheels.

It will be observed that, if, in Fig. 4, the wheels rotate in the opposite direction, through motion of the car in the opposite direction, what has been considered the rear pair of wheels will now become the forward pair. At the same time, also, the effect of the inclined hangers upon the two pairs of wheels has been reversed, so that it is still, under the changed conditions, the leading pair of wheels which is subjected to the greatest brakeshoe pressure, and the rear pair of wheels which is subjected to the reduced pressure. Here, then, is a method of the utmost simplicity which fulfills the requirements of the case.

A most important feature of this method will, doubtless, not have escaped observation. This feature consists of the fact that the conditions prevailing in Fig. 4 are those for brakes which are hung between the wheels. As a foremost consideration it is necessary, in order to realize the advantage of the principle of inclined brake hangers, that the brakes shall be inside hung. It has been the practically universal custom to suspend the brakebeams of passenger trucks outside of the wheels. This is radically wrong if proper efficiency of the brakes is desired. The most important [advantage [of inside hanging] is that *the brakeshoe pressure* upon the different pairs of wheels may be so proportioned that in an emergency application of the brakes *trains may be stopped in from* 10 *to* 15 *per cent. shorter distance* without any increased increased liability of injurious wheel sliding. This advantage is, of itself, so important as to overshadow all objections.

Another important advantage is the *smoothness* with which passenger train stops may be made. The tilting action of the ordinary passenger truck, during an application of the brakes, and the resulting jolt at the stop, has commonly been observed. This is due, in part, to the fact that the truck is being dragged forward by the car body, against the resistance offered to its continued motion by the rail friction. But this tilting action is much aggravated because of the fact that the brake hangers of the rear brakebeam are thrusting upwardly upon the truck frame while the hangers of the forward brake beam are pulling downwardly upon the truck frame.

Still another most excellent feature of inclining the brake hangers is the fact that the weight of the brake beams and attached parts thereby tends to swing the

brakeshoes away from the wheels, after release of the brakes.

The inside hung brake gear for passenger trucks is not only more compact and simple, but it is less costly in construction and maintenance. It enables brakeshoe slack to be taken up more evenly and completely. It enables the proper braking power—and thus the full efficiency of the brakes—to be calculated with greater certainty. In connecting and disconnecting the brake gear upon the truck there is no resistance of release springs to be overcome, and the removal and replacement of brakeshoes is thereby facilitated. All this is in addition to the fact that the brakebeams may be so suspended as to enable the train to be stopped in 10 *or more per cent. shorter distance* than when the brakes are outside hung, with no greater liability of sliding wheels and with the removal, to a large extent, of the discomforting jolt to passengers that is so often experienced as the train comes to a stop.

Nothing has, as yet, been said with respect to outside hung brakes which are suspended from the car body, but an investigation of the conditions prevailing when brakes are thus hung from the car body emphasizes the undesirability of this form of brake gear.

It will be interesting to now compare the braking force and the retarding friction of the brakeshoes under the various conditions heretofore existing in practical service. The figures given in the tables are those computed by the methods given in the appendix, and the braking power and total brakeshoe friction given are those which will produce the same tendency to slide wheels in each case. The braking power given is computed to be the highest which, under normal conditions of air pressure and brake cylinder piston travel, will result in no harmful sliding of wheels, under the average condition of service.

Brake gear.	Size and kind of wheels.	Braking power in percentage of weight.	Total brakeshoe friction in percentage of weight.
Freight, inside, truck frame	33-in. cast iron.	68.8	19.7
Passenger, outside, truck frame	36-in. steel tired.	88.	20.8
Passenger, outside, truck frame	33-in. cast iron.	76.5	20.8
Freight, outside, car body	33-in. cast iron.	70.4	20.4

It will be observed that, in freight service, a somewhat greater braking power may be employed, causing a slightly greater retarding friction, when the brakebeams are hung from the car body. This is because less weight is transferred from one pair of wheels of the truck to the other pair than when the brakes are inside hung. When the brake hangers are inclined, however, this form of brake gear is notably inferior, as shown by the following table of maximum inclinations:

Brake gear.	Wheels.	Inclination of hanger to tangent.	Braking power, in percentage of weight.	Total brakeshoe friction in percentage of weight.
Freight, inside from truck	33-in. cast iron.	34° 53′	95.2	24.8
Passenger, inside from truck	36-in. steel tired.	32° 26′	110.4	25.2
Passenger, inside from truck	33-in. cast iron	28° 2′	94.7	25.
Freight, outside from car.	33-in. cast iron.	25° 49′	80.7	22.8

The surprising effect of the angularity of the brake hangers, in permitting a greatly increased braking power without increasing the danger of sliding wheels, will be at once recognized by comparing the figures in this table with those in that last preceding. The real value of the inclination of the brake hangers is, however, to be discovered by comparing the retarding frictions of the brake shoes upon the wheels. The efficiency of the brakes has been increased from 20 to 25 per cent. in each case, except that in which the brakes are hung from the car body, where the increased efficiency is only about 12 per cent.

The freight car body is shorter than the passenger, while the distance of its center of gravity above the center plate is not materially different from the corresponding distance in passenger cars. In an emergency application of the brakes, therefore, a greater proportion of the weight of the car body is transferred from the rear to the forward truck, so that the friction of the brakeshoes upon the wheels of the freight truck must be proportionately less than upon the wheels of the passenger truck. The reason why the frictional efficiency is greater in the case of the passenger car with steel-tired wheels than in that of the same passenger car with chilled cast-iron wheels is that 36-in. steel-tired wheels are very much heavier than 33-in. cast-iron wheels, and a greater brakeshoe friction must be employed because a greater portion of it is absorbed by the increased rotative energy of these heavier wheels, and only what then remains can operate to stimulate retarding rail friction. The distance in which the car could be stopped in an emergency application of the brakes would be about the same whether the wheels employed are cast iron or steel-tired.

It is not pretended that the remarkably increased efficiencies indicated in the last table can be fully realized in practice. It is unfortunately the fact that they cannot, for the simple reason that it is impossible to constantly maintain any particular angle of inclination of the brake hangers, on account of the wear of the brakeshoes and wheel treads and, where journal boxes are in pedestals, the variableness of the lost motion in the pedestal. The difference in the inclinations of the brake hanger, from a time when both brakeshoe and wheel are new to a time when both brakeshoe and wheel are worn out, would be very small if the length of the hanger could be made sufficiently great; this difference of inclination of the hanger becomes very great, however, when the hanger is short.

In designing brakes with inclined hangers, therefore, it is of the utmost importance that the brake hangers should be as long as possible. For this reason it is important to use brakeheads of such a construction that the lower end of the hanger shall be as near the center of the brakeshoe as possible. Fig. 8 will serve as an illustration of this most desirable feature. Those forms of brakehead in which the lower end of the hanger is secured at a considerable distance above the center of the brakeshoe are least to be desired.

Fig. 8

In practice it is necessary to select a position of the brakehead midway between that occupied when the shoe and wheel are new and that occupied when the shoe and wheel are both worn out, and there apply the hanger at the calculated angle of inclination. The maximum braking power must then be calculated to accord with the lesser angle of inclination of the hanger when the brakehead is moved back into the position occupied when the brakeshoe and wheel are both unworn. While, therefore, it is not possible to practically attain the highest theoretical efficiency of the brakes, it is, nevertheless, possible to realize a much higher stopping efficiency of the brakes than that which has heretofore existed. A few examples will serve to illustrate the practical application of this method of hanging brakes.

Fig. 9 illustrates the application of inside brakes with inclined hangers to a Canadian Pacific passenger truck. In this case, the angle of inclination, when shoes and wheels are new, is 15 deg. 49 min., and the length of the brake hanger is 18 in., the form of brakehead shown being necessary on account of the position of the equalizer spring seat. The calculated braking force is about 95 per cent. of the weight of the car, and the total maximum friction of the brakeshoes in an emergency application is about 22.9 per cent. of the weight of the car. The stopping efficiency is theoretically about 10 per cent. greater than if the brakes had been hung in the ordinary way. A train of Canadian Pacific cars, with this truck brake equipment, was tested upon the main line of the road near Montreal. The day was a fair one and the rails in average condition. The stops were made with the high-braking power upon a portion of the cars, and a braking power of 90 per cent. upon others. The wheels of the cars with high-braking power slid during the last 10 or 15 ft. of each emergency stop, and the wheels of the cars having the 90 per cent. braking power slid through about half this distance. Fearing that the brakeshoes were not yet properly fitted to the wheels to make highly efficient stops, it was requested in advance that no speed recorder be applied to the locomotive, and that no attempt be made at that time to determine the stopping efficiency of the brakes. All present were so much impressed, however, with the unusual effectiveness of the brakes, that one or two stops were made from estimated speeds, and the distance measured. Making ample allowance for errors in judgment as to speed, the stops made appeared to be about 15 per cent. shorter than any recorded passenger train stops from similar speeds.

Fig. 10 illustrates the application of inside hung

Fig. 9

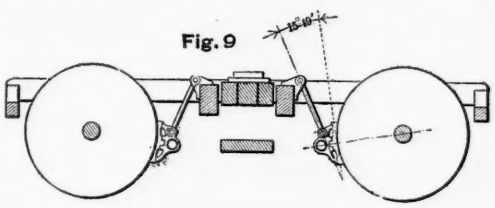
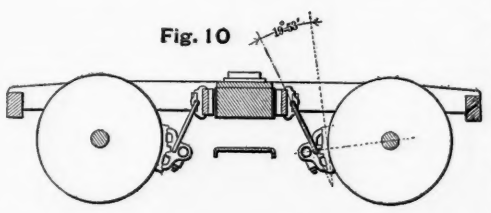


Fig. 10

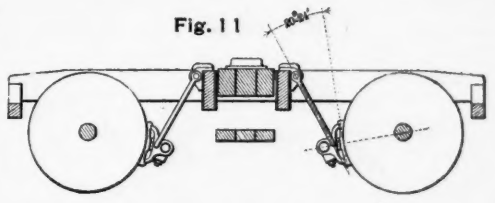


brakes to the standard passenger truck of the Pennsylvania Railroad, the angle of the hanger being 19 deg. 53 min. when the shoe and 36-in. chilled iron wheel are new. The calculated braking power is about 86 per cent. of the weight of the car, and the total maximum brakeshoe friction in an emergency application of the brakes is 23.3 per cent. of the weight of the car. The stopping efficiency of this brake gear is about 13 per cent. greater than if the brakes were applied in the ordinary way. No actual tests of the efficiency of the brakes on these trucks has yet been made, so far as the writer is aware.

Fig. 11 illustrates the standard passenger truck of the Erie Railroad. The length of the brake hanger is 24 in., and the angle of inclination is 20 deg. 24 min. when the brakeshoes and 36-in. steel-tired wheels are new. The braking power is about 97 per cent. of the weight of the car, and the total maximum friction of the brakeshoes is 23.2 per cent. of the weight of the car. The increased stopping efficiency of this brake gear is about 13 per cent. greater than would be the case if the brakes were hung in the ordinary manner It has been impossible to congregate the new cars having this style of brake gear for the purpose of making any practical test as to the efficiency of the brakes. Mr. Mitchell reports, however, that an examination reveals the fact that no case of injurious wheel sliding has resulted from the high-braking power used, except in one instance where all four pairs of wheels of one car were slid. This case appears to be entirely due to special causes which had nothing to do with the character of the brake gear.

It may be said in conclusion that there appers to be no reasonable doubt that high efficiency of brakes can only be attained by suspending the brakebeams from the truck frame and between the wheels. It is rarely a difficult matter to so suspend the brakebeams of four-wheeled passenger trucks that the stopping efficiency of the brakes will be at least 10 per cent. greater, and so that trains may be stopped in approximately 10 per cent. shorter distance than if the brakebeams are hung in the customary manner. It may be questioned whether a considerable proportion of the freight trucks in service have a sufficiently long wheel base to enable the full advantage of inclining the brake hangers to be realized.

Fig. 11



Where the wheel base is short it is impossible to make use of sufficiently long hangers at a sufficient inclination, and it is preferable to use longer hangers with a less inclination.

In making a practical application of the principle of inclined hangers, the investigations by Mr. Waldo H. Marshall, now Assistant Superintendent of Motive Power of the Chicago & Northwestern Railway, published under the title of "The Efficiency of Air and Foundation Brakes," in the Proceedings of the Western Railway Club for April, 1894, have been of the greatest service. So far as the writer can learn, these are the only recorded experiments through which a fairly accurate knowledge of the relationship between the calculated pull and the actual pull upon a brakebeam has been supplied. The methods employed by Mr. Marshall give great reliability to his final results, and it is only to be regretted that his experiments might not have been extended to cover a greater number of cars.

The writer is also under special obligations to Mr. A. S. Vogt, Mechanical Engineer of the Pennsylvania Railroad. It will already have been observed, and more particularly by those who are interested in following the analytical methods given in the appendix, that the heights of the centers of gravity of the car body and the truck are elements in the determination of the results herein set forth. So far as the writer could learn, the only figures at hand, in this respect, were those reached by computation, and so many uncertainties surround such calculations that such results could hardly be deemed entirely trustworthy. Through Mr. Vogt's interest and kindness, different classes of car bodies and trucks have been, one after another, suspended in the air in such positions that their centers of gravity were experimentally located with sufficient accuracy for all practical purposes. It is interesting to add that these experiments demonstrated the fact that the computed positions of the center of gravity (so far as such computations have extended) were not far from accurate. The various results determined by Mr. Vogt will be found in a table at the end of the appendix.

It is important to add, in conclusion, that the braking power given in the tables (and indicated in the appendix) for passenger cars with chilled cast-iron wheels is doubtless much too low. The figures given depend upon the same maximum coefficient of friction between the brakeshoes and wheels that is found to occur in freight service. The later investigations of the Master Car Builders' Committee on Laboratory Tests of Brakeshoes conclusively showed that, under the much greater brakeshoe pressures in passenger service, the coefficient of friction is materially less than it is in freight service. While the 1896 report of the committee does not clearly indicate the exact reduction in the maximum coefficient of friction, it does indicate that, with the same brakeshoe pressure, the friction is about the same upon cast iron as upon steel-tired wheels. In view of this fact, the prevailing custom of employing the same braking power for cast-iron wheels in passenger service as that used for steel-tired wheels seems to be fully justified.

TECHNICAL.

Manufacturing and Business.

The Department of Docks of New York City will receive bids until Nov. 22 for preparing for and building a new pier at the foot of Jane street, North River.

The Colorado Valley Railroad, now being built between Sweetwater and Austin, Tex., 75 miles, is in the market for 60-lb. rails. Irving Wheatcroft, of Sweetwater, Tex., is Vice-President and General Manager.

Gen. J. S. Megley, Vice-President and General Manager of the Richmond, Petersburg & Carolina Railroad now being built from Richmond, Va., to Ridgeway

N. C., informs us that he is in the market for rails for 106 miles of road. His address is 136 Liberty street, New York City.

S. Ritter Ickes, of Harrisburg, Pa., who is promoting a new electric road in the Lykens Valley, Pa., wants to buy four miles of good second-hand girder rails of 50 or 60 lbs., and also some second-hand tee rails in good condition.

Stephen J. Burke, of Sydney, N. S. W., is in New York City for the purpose of obtaining the agencies for New South Wales, for several classes of railroad materials. He can be addressed at 332 Broadway.

George B. Post, architect, 33 East Seventeenth street, New York City, has been commissioned to draw plans for a 16-story pressed brick mercantile building to be built in Cleveland, O. The building will be of steel skeleton construction and cost about $500,000.

At a special meeting of the Directors of Pullman's Palace Car Co., in Chicago, Nov. 11, Robert T. Lincoln was elected a Director to fill the vacancy caused by the death of George M. Pullman, and was also made chairman of an executive committee appointed to take general charge of the business affairs of the company, in which capacity he will be acting President. The other members of the committee are Marshall Field and H. C. Hulbert.

Joseph Taylor has resigned as Secretary of the Michigan-Peninsular Car Co., of Detroit, Mich.

Fraser & Chalmers have decided to enlarge their plant at Washtenaw avenue, near Twelfth street, Chicago, so that it will accommodate their entire business. The additions will cost about $200,000, and as soon as they are finished the premises now occupied by the firm at Fulton and Union streets will be vacated.

The Skinner Electric Brake Co., of New York City, has been formed to make and sell electric brakes. The capital stock is $500,000, and the incorporators are James D. Ganner, of Brookline, Mass.; Frank L. Pashaw, of Canton, Mass.; E. S. Shepherd, of Attleboro, Mass.; Benjamin Pope, of Boston, and A. F. Copeland, of Newton, Mass.

The Berlin Iron Bridge Co., of East Berlin, Conn., has received the contract to furnish the steel work for a new boiler-house for the Waterbury Buckle Co., of Waterbury, Conn.

The Kenawee Mfg. Co., of Jersey City, N. J., has been incorporated by Joseph Zimmerman, E. G. Buchanan, of New York City, and Robert S. Green, of Elizabeth, N. J., with a capital stock of $17,000. The company will make railroad supplies.

G. F. Fogle, of Pittsburgh, and C. I. McDonald, F. T. McDonald, J. S. McDonald and E. B. Fogle, of Allegheny, Pa., have formed the company of McDonald, Fogle & Co., of Pittsburgh, to conduct a railroading and general contracting business. The capital stock is $500,000.

The Chicago Pneumatic Tool Co., Monadnock Block, Chicago, this week received orders for eight Boyer pneumatic hammers from Austria and for 10 hammers from Great Britain.

The Economic Power Co., of Rochester, N. Y., has been incorporated by John N. Beckley, F. S. Upton, A. Luetchford, E. M. Upton, of Rochester, N. Y., and L. M. Howe, of Indianapolis, Ind., for the purpose of making and dealing in engines and pumps. The capital stock is $100,000.

The Illinois Steel Co. has received an order for 20 miles of 85-lb. rails from the Terre Haute & Indianapolis Railroad. This will be laid on the main line of that road between Indianapolis and East St. Louis.

H. A. Siegrist, I. D. Worrell and James P. Dawson are mentioned as incorporators of the Siegrist Lubricator Co., of St. Louis, Mo. The capital stock is $25,000.

The Forsythe Bros. Co., of Chicago, has been incorporated under the laws of Illinois to make railroad fixtures, supplies and upholstering. The capital stock is $25,000 and the incorporators are Wm. H. Forsythe, Geo. H. Forsythe eand Louis T. Mann.

Iron and Steel.

The S. Flory Mfg. Co., of Bangor, Pa., has been incorporated under the laws of Pennsylvania for the purpose of making steel. The capital stock is $100,000.

All the furnaces in Allegheny County, Pa., 30 in number, are now in blast, furnace F of the Edgar Thomson plant having started up last week.

The Bethlehem (Pa.) steel mill resumed work Nov. 15, after an illness of two months.

The Schuylkill Valley Steel Co. has been organized at Birdsboro, Pa., for the purpose of making sheet and plate steel. The incorporators are: Charles James, of Tacony, Pa., Edward Brooke, George Brooke, Jr., and Robert E. Brooke, of Birdsboro, and Henry Potts, of Pottstown, Pa. The capital stock is $200,000.

The furnace of Pierce Bros., at Sharpsville, Pa., is being prepared for blast after an idleness of more than two years.

New Stations and Shops.

The Grand Trunk has had drawings prepared for a large office building in Montreal. It will be four stories high, 70 ft. wide and 260 ft. long, and cost about $250,000. It will be located on Victoria Square.

The Moulton-Fisher Co., of Chicago, has been awarded the general contract for building the new shops of the Cincinnati, Hamilton & Dayton at Lima, O. The structural iron work will be done by the Toledo Bridge Co., of Toledo, O.

The shops of the Central of Georgia, at Macon, Ga., which were recently partially destroyed by fire, will be rebuilt. The railroad company will do the work.

Shepley, Rutan & Coolidge, architects, of Boston, Mass., are finishing plans for the new Back Bay station for the New York, New Haven & Hartford Railroad in Boston. F. S. Curtis, Chief Engineer of the road, informs us that no date has yet been set for asking bids, but every effort is being made to get the work under way in the near future.

As mentioned some time ago in these columns, the Chicago, Milwaukee & St. Paul is building a new passenger station at Minneapolis on the site of the old one. This station will be approximately 120 ft. wide by 121 ft. long. The main building will be three stories high, the ground floor being used for waiting-rooms and ticket office, while the two upper stories will be used as offices for the various officials of the road. The contract for the foundations has been let to Trainor Bros., and the contracts for the balance of the work will be let about the middle of December. The foundations are stone on a bed of concrete. The walls of the building proper will be of Ortonville granite for the first story, above which the walls will be of mottled yellow brick with terra cotta trimmings. Fireproof construction will be used throughout. The plans contemplate using either a trainshed spanning five tracks, or simply covered platforms. In the latter case only four tracks will be used. The cost will be approximately $175,000 if trainsheds are built; without trainsheds the cost will be about $150,000.

The Wabash Railroad is asking bids for a new depot to be built at Vandeventer avenue, St. Louis. The architect is August M. Beinks, of St. Louis.

Comparative Economy of Direct-Connected and Belt-Driven Generators.

Very recently we endeavored to obtain from some street railroad managers and from engine builders information concerning the relative economy between direct-connected and belt-driven generators in electric railroad work. Our inquiries met with no favorable response inasmuch as *accurate* tests had not been made by those with whom we communicated. We learn, however, that such a test has been made at the power-house of the Chester Traction Co., Chester, Pa. A tandem compound condensing engine built by Robert Wetherill & Co., with cylinders 20 and 36 in. × 48 in., and designed to run at 100 revolutions a minute, was direct connected to an 8-pole, 400 KW. multipolar G. E. generator, running at 100 revolutions. The engine was supplied with steam from four horizontal return tubular boilers burning a fair quality of Likens Valley buckwheat coal, free from moisture. The results of the test, which lasted 17 hours, 30 minutes, showed that the coal consumed in pounds per kilowatt hour was 3.004, and the coal in pounds per engine horse power was 2.242. This test was followed by one on two condensing engines with cylinders 22 × 48 in., and running at 80 revolutions. These engines were also built by the same company as those used in the other test and were supplied with steam from the same source as the compound engine. Coal from the same source was used in both cases. The boiler pressure was 100 lbs. A Westinghouse compound railroad generator of 225 KW. was belted to each engine. The results of this test showed that the coal in pounds per kilowatt hour was 3.882. The feed water per engine horse power was 2.901. A comparison of the two results showed a saving in coal of 22.7 per cent. in favor of the tandem compound, and while this saving would have been less had there been one instead of two generators in the latter case, yet the results show unmistakably the economy of direct-connected units. Besides this, Mr. J. D. Rostron, Civil Engineer of the Chester Traction Co., points out that the difference of the interest on the cost of installation would be comparatively small and would reduce the above figure but about 7½ per cent.

Referring to the above tests, Mr. Rostron writes as follows: "I have made other tests upon the same pair of engines and the results show an economy of 20.6 and 21.3 per cent. I wish to note, however, from close observations, I find compounding for railroad work is productive of good results providing the proper method of valve setting is adopted. I arrived at the present stage of economy after changing the relation of cut off in the two cylinders three times on the present compound engine. One point to avoid is receiver expansion, which is a great loss."

Gas Motors and Electric Motors.

Some time ago a company, interested in introducing gas engines as motors on street railroads, built a railroad in Dessau which was to demonstrate the advantages of such motors, and serve as a model. Now this railroad has contracted with Siemens & Halske for an electric plant.

Portable Steel Culverts.

Mr. W. A. Nichols, Girard Building, Philadelphia, sends us a catalogue of portable metallic culverts for railroads and highways, made under the Barnes patents. This culvert is made of plates and shapes and has a trapezoidal cross-section. The stiffening angles are all outside, giving smooth surfaces inside and good support externally for the earthen bank or for paving. This culvert has been tried experimentally and is said to be cheaper than a masonry culvert.

Electric Traction in Munich.

All the street railroads in Munich are to use electricity as motive power within two years and charge a uniform fare of 2.4 cents.

Coupler Litigation.

On the 9th inst., at Utica, in the United States Circuit Court in the Northern District of New York, in the suit of the Gould Coupler Company *versus* The Trojan Car Coupler Company, Judge Coxe rendered a decision in favor of the defendant.

New Steamer for West India Trade.

The William Cramp & Sons Ship & Engine Building Co., of Philadelphia, has received a contract to build four new vessels for the use of the Boston Fruit Co. in its West Indian trade. They will be of steel 290 ft. long, with a 36-ft. beam, and accommodate 100 passengers. The speed will be 15 knots an hour.

Pig Iron Production in October.

The monthly report of the production of pig iron in the United States, as published in the *Iron Age*, shows a further increase for the month of October. On Nov. 1 there were 183 furnaces in blast, with a weekly capacity of 213,159 gross tons, against 171 furnaces in blast Oct. 1, with a weekly capacity of 200,128 gross tons and against 133 furnaces in blast Nov. 1, 1896, with a weekly capacity of 124,077 gross tons. Stocks, sold and unsold, Nov. 1, aggregated 753,537 tons, against 802,427 tons Oct. 1.

Awards at the Brussels Exposition.

The following is a list of awards made at the Brussels Exposition in the machine tools section:

1st.—The "Grand Prix," or highest possible distinction, was awarded to but three concerns, one foreign and two American.

Brown & Sharpe Mfg. Co., Providence, R. I.
The Pratt & Whitney Co., Hartford, Conn.
Le Progres Industriel, Brussels, Belgium.

2d.—The gold medal, or next to the highest distinction, was awarded to eight foreign and nine American competitors.

Cincinnati Milling Machine Co., Cincinnati, O.
Gould & Eberhardt, Newark, N. J.
G. A. Gray Co., Cincinnati, O.
J. Becker Mfg. Co., Fitchburg, Mass.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Norton Emery Wheel Co., Worcester, Mass.
Prentice Bros., Worcester, Mass.
Bullard Machine Tool Co., Bridgeport, Conn.
Warner & Swasey, Cleveland, O.

3d.—The silver medal was awarded to eight foreign and nine American competitors.

Acme Machinery Co., Cleveland, O.
W. F. & J. Barnes, Rockford, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Bradford Mill Co., Cincinnati, O.
Gisholt Machine Co., Madison, Wis.
Landis Bros., Waynesboro, Pa.
F. E. Reed Co., Worcester, Mass.
Bradley Co., Syracuse, N. Y.
Hendey Machine Co., Torrington, Conn.

4th.—The bronze medal was awarded to four American competitors.

D'Armour & Littledale, New York City.
Dwight Slate Machine Co., Hartford, Conn.
Hurlburt Rogers Machine Co., South Sudbury, Mass.
L. S. Starrett Co., Athol, Mass.

Government Armor Plant.

According to newspaper dispatches from Washington, the Navy Department is preparing to issue calls for building an armor plant upon plans to be furnished by the special Armor Board, which will report by Dec. 1. No bid, however, can be accepted by the department until building for the factory is authorized by Congress. It is understood that the Board will make no recommendations as to site. The Carnegie and Bethlehem Steel Companies are expected to submit proposals for selling their armor plate plants to the government. We have been informed that Mr. John Fritz has had charge of the design and specifications for the plant. We can wish the nation no better luck than that he should be the Supervising Engineer until the works are finished—if they are to be built.

Consolidation of Steel Tube Manufacturers.

The Brewer Seamless Tube Co., and the American Weldless Tube Co., of Toledo, O.; the Shelby Tube Co., of Shelby, O; the Ellwood Tube Co., of Ellwood, Pa.; and the Greenwood Tube Co., of Greenwood, Pa., have been consolidated under the name of the Shelby Tube Co., with a capital stock of $5,000,000. The headquarters will be at Shelby and W. H. Miller will be President and General Manager. The minimum output of the combined mills is stated as 50,000,000 ft. a year and the firms named control 90 per cent. of the output of tubing in this country. A special bid will be made for foreign business and it is believed that the new company will undertake to produce steel billets by the open hearth process.

THE SCRAP HEAP.

Notes.

The engine house of the Boston & Maine at St. Johnsbury, Vt., was burned down on the night of Nov. 11. Nine engines were badly damaged.

The St. Louis limited night express from Kansas City over the Missouri Pacific was stopped by robbers near Independence, Mo., on the night of Nov. 12, but it is reported that the robbers got only $3, which was money taken from the express messenger's pockets. The messenger promptly opened the safe on demand, there being no treasure in it.

The Brotherhood of Locomotive Engineers has bought the Meadow Lawn Farm at Mattoon, Ill., which is an

estate of 250 acres, and the press reports say that it is to be used as a home for dependent engineers. We learn, however, from Mr. Arthur that no definite action of this kind has been taken by the Brotherhood, and that none is likely to be taken until the next convention, which comes on May 11, 1898.

George M. Grant, a lumber dealer, having been struck by a locomotive of the New York, Susquehanna & Western, on a side track near his lumber yard, and badly injured, sued the road and secured a verdict of $51,527 damages; but on appeal to the Supreme Court of New Jersey the verdict was set aside as excessive. Chief Justice Magee announced that unless the plaintiff would accept $30,000 a new trial would be granted.

On the night of Nov. 6 a passenger train of the Santa Fe Pacific was stopped by robbers at Grant, N.M., and the express car was wrecked by dynamite. Some money and other valuables were taken, but the amount is not stated. Before attacking the express car the robbers had compelled the fireman to detach it and pull it some distance away from the rest of the train. After the robbery, the express car being afire, the fireman pushed it back toward the rear portion of the train, and, being greatly excited, ran it into the passenger cars with such force as to badly damage two of them, which, with the express car, took fire and were burned up.

"Record discipline" was adopted Nov. 1 on the Freeport, the Dubuque and the Cherokee divisions of the Illinois Central. Suspensions were abolished and all employees were started with a clear record on the date named. The circular announcing the change defines a "perfect" record as one against which no unfavorable entry has been made. A "clear" record is one on which unfavorable entries have been extinguished. "Suspensions" (suspension on paper) will not be made for less than five nor more than 60 days. A reprimand will be extinguished by a clear record of three months; five days' suspension by six months; 10 days by nine months 30 days by one year; 60 days by 18 months.

State Safety-Appliance Laws.

The report of the October meeting of the American Railway Association, just issued by Secretary Allen, contains abstracts of the state laws concerning railroad safety appliances which are now in force in the states of Arkansas, Colorado, Connecticut, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, New Hampshire, New Jersey, New York, North Carolina, Ohio, Rhode Island, South Corolina, Texas, Vermont, Virginia and Wisconsin.

Explosiveness of Acetylene.

The direct examination of Professor Mixter, recently held in regard to his experiments concerning the explosiveness of acetylene, has revealed some interesting facts about the gas. The fatal acetylene explosion that occurred in New Haven about a year and a half ago was instrumental in bringing about this exhaustive experimental test.

The principal facts concerning the gas ascertained from these experiments and tests are, first, that the gas is not more perilous under heavy pressure than those acquainted with the inherent dangers of any gas under compression have accredited to it; secondly, that the gas is endothermic, that is, heat is absorbed when it is made from its elements, and heat is given off when it is decomposed; thirdly, that an explosion of acetylene and air is more violent than illuminating gas and air; and it is also shown that an explosion will not take place with increase of pressure alone, but heat must be applied.

In regard to the violence of decomposition or explosion, with increase of pressure, the following facts have been determined: Under a pressure of one atmosphere the gas does not explode when a spark is applied to it, neither does it explode under two atmospheres when a spark is applied, but under a pressure of three atmospheres there is a sharp explosion, the violence of which increases with the pressure, and we have the law: the rate of decomposition increases with the pressure.

There is now no way of verifying the cause of the explosion before referred to. It is almost certain that in some way the gas was ignited.

From this investigation it is concluded that when used with care acetylene is no more liable to explosion than illuminating gas, but should such an explosion occur the result would doubtless be more disastrous.—*Yale Scientific Monthly.*

Wooden Bridges in Europe.

It is rather unusual to hear of wooden bridges in Europe, for either highway or railroad traffic, but where good timber is available the subject of wooden bridges has received some attention, especially in Austro-Hungary, in the parts of which there are forests of great value for this purpose. The *Journal of the Austrian Engineers and Architects Society* lately published an article on the subject of wooden bridges in Galicia, with a detailed description of several types. While the Howe truss seems to be the usual type adopted in those parts of Europe where there is any occasion to put up a wooden bridge, the Austrian engineers appear to be trying quite a variety of types especially for highway bridges. Those that are referred to in the *Journal* are of spans ranging from 82 to 144 ft. in length, and the article gives very full descriptions and illustrations of them.

"Schenectady No. 2."

The new locomotive known as "Schenectady No. 2," built by the Schenectady Locomotive Works for the Locomotive Testing Laboratory at Purdue University, has been received at Purdue.

Dock Contract for Boston.

The Harbor and Land Commissioners have awarded the contract for the new public dock at South Boston to Perkins, White & Co., of Boston, for $198,516, and it has been signed.

What the French Call Fast Running.

The *Journal des Transports* reports the latest feats in fast running in France. On occasion of the great army manœuvers the Northern Railroad placed a special train at the disposal of President Faure and his guest the King of Siam. Without the engine this train weighed 226 tons. It was hauled by a compound locomotive. Going out, this train ran from Paris to St. Quentin, 96 miles, in 103 minutes, giving an average speed of 56 miles an hour, nearly. There was no stop on the way, but the train had its speed checked materially at one place where a temporary track passed around some new work, and slightly at three stations where are several junctions. The long up-grade near Paris was passed at the rate of 50 miles an hour, the downgrade following at 68 miles an hour. Exactly the same time was made returning. The President on a different trip was carried from St. Quentin to Amiens, on the way to Havre, 55 miles, in 54 minutes.

The West India Electric Co., Ltd., of Jamaica.

Mr. W. B. Chapman, of Montreal, writes as follows: A valuable, exclusive and practically perpetual franchise has been secured by a Canadian company to build and operate tramways and other electrical enterprises in the island of Jamaica. The old horse tramway, which has earned 15 per cent. to 20 per cent., has been purchased and a first-class trolley line of about 25 miles will be built at once in Kingston and St. Andrew. The population served will be over 80,000 and a tropical climate makes traffic certain. The heaviest grade is 2 per cent. and only open cars (first and second class) will be required. It will be capitalized at $800,000, with $600,000 bonds, all of which have been taken up. Construction will begin very shortly and completed by next July. The gentlemen who have undertaken this enterprise are Lord Strathcona (Sir Donald A. Smith), James Ross, C. E. L. Porteous, Wilham McLennan, W. B. Chapman, L. J. Forget, G. C. Cunningham, Fayette Brown and K. W. Blackwell, of Montreal; F. S. Pearson, of New York, B. F. Pearson and W. B. Ross, of Halifax.

To Build a Railroad in Honduras

A recent consular report says that a concession to build a railroad across Honduras, from Puerto Cortez on the Atlantic coast to the Bay of Fonseca on the Pacific coast, has been given to an American syndicate by the Honduras government. The government grants the syndicate the railroad, now running from Puerto Cortez to La Pimienta, a distance of about 30 miles. The company has a right of way over land and water throughout the length of its route—the water rights being limited, however, to the construction of bridges, wharves, etc., necessary in the operation of the railroad. A subsidy of 100 ft. of land is granted on each side of the road, whether it passes through public or private lands. When the road passes inhabited sections, only half this width of land is granted. The government concedes five square miles of land for every mile of railroad built. The land is to be located contiguous to the roadway. Branch roads can be built under conditions similar to those given for the main road, and one of these will extend to Tegucigalpa. The company can use all materials necessary for the road which are found on the government lands, and no charge will be made for the same. It also has the right to all minerals, etc., found in the lands conceded.

The gage of the road is to be not less than 3 ft. 6 in., and five miles are to be built within the first year. At the end of the second year 25 miles are to be finished; at the end of the third year 50 miles; at the end of the fourth the road is to reach Comayagua; at the end of the sixth year the line is to be completed and opened to the public. After 75 years, the government will have the right to buy the road, and at the end of 99 years the road is to become the property of the state.

The syndicate undertakes to liquidate the public debt of Honduras, and offices for this purpose will be opened in New York, London and Paris. A bank is to be established, under the name of the Commercial Bank of Honduras, with a minimum capital of $500,000.

A copy of the contract gives the names of the syndicate as follows: Chauncey M. Depew, W. Seward Webb, John Jacob Astor, Benjamin F. Tracy, J. G. McCullough, Frederic B. Jennings, George S. Scott, Nathaniel A. Prentiss, Charles McVeigh and Melville E. Ingalls, Jr. The agents for the syndicate were Henry L. Sprague and W. S. Valentine, of New York.

Electricity on a Steam Railroad.

The St. Louis, Kansas City & Colorado Railroad is preparing to make a practical test of the Seaton third-rail device on its line. The road is 55¼ miles in length, extending from St Louis to Union, Mo. The road was incorporated in 1884, and the earnings for the year ending June 30, 1896, amounted to $89,372, the operating expenses were $119,907, and the miscellaneous receipts of $815 brought the net deficit to $29,720 for that year. After taking into account the interest on the bonds there was a deficit of $115,380, bringing the total deficit up to June 30 last year to $1,741,092. It might appear from these figures that the road intends to adopt electricity as a last resort.

A Fog in New York.

It probably occurred to more than one of the belated passengers that the fog could not, in the case of an underground road, play such havoc with the time of busy people.—*Evening Post.*

How does the able editor propose to keep fog out of the tunnel? Even our lamented friend Greathead never expected to be able to do that.

The Engineer School at Willets Point.

Regulations for the government of the United States Engineer School at Willets Point, N. Y., have been approved by the Secretary of War and issued from Army headquarters. The school is similar in purpose to that of artillery at Fort Monroe and of cavalry and infantry at Fort Leavenworth, the course being wholly post-graduate. The object is to increase the professional qualifications of officers assigned to the Corps of Engineers; to conduct researches in the branches of science applicable to the duties of that corps and to prepare manuals of instruction and guidance for engineer officers and soldiers. Departments of military, electrical and civil engineering are established, with captains as instructors under the commandant of the station. Engineer officers will be under instruction for two years. The degree of proficiency in the case of others than engineer officers taking the submarine-mining course will be indicated as: Qualified to take entire charge of the submarine mine defence of a harbor; qualified to take charge of casemate work and planting mines, and qualified to take charge of planting mines. The programme of instruction includes reconnoissances, maps, military photography, explosives, military bridges, campaigns, land and coast defenses, the application of electricity to sea coast and land defenses and transmission of power, preliminary examinations of navigable waterways, river and harbor improvements, detailed study of building materials, etc., etc. The courses of instruction will be supplemented by lectures by officers of the army and navy and civilians, as well as by visits to manufacturing establishments and to important works of civil and military engineering.

The "Brakes Failed to Work."

We have long been familiar with the excuse of the delinquent engineman that "the air-brakes failed," but we are bound to say that we do not very often hear that now, the superior officers have grown too wise. It seems, however, that the European engineman is not ignorant of the same resource. Last August in Austria a fast train ran through a station where it should have stopped and plunged into the side of another train. The engineman said it was the fault of the Westinghouse brake, which would not go on. The whole brake apparatus was put under seal, and recently when the magistrate began to investigate the case he ordered it out on the same line of road at the speed rate, about 50 miles an hour, and called for brakes several times, and every time they worked perfectly. It looks dark for the engineman.

Notes of Improvement on the Great Northern.

We gave last week a brief synopsis of the annual report of the Great Northern Railway. We find in that report that during the year the company has purchased 12 mogul freight engines, 751 60,000 lb. box cars, one Lidgerwood rapid unloader and three heavy steam shovels, besides some other car equipment. The application of air-brakes and automatic couplers has gone on, and about 60 per cent. of the cars belonging to the system are now so fitted and the remainder will be equipped during the coming year. The improvement in the water supply is being carried on, dams and reservoirs and power supply plants having been built at several places. The St. Paul shops have been equipped with an outfit of pneumatic tools and appliances for boiler and sheet work. During the year 51 bridges and trestles were replaced, 10 with steel bridges and the rest with banks. Of 127 wooden bridges and trestles originally built there are now only four bridges and 41 trestles left. On the Montana Central all the wooden bridges between Helena and Butte are being filled or replaced with steel and masonry, and that work will be done this fall.

North Carolina Railroad Commissioners.

Judge Cable, of the State Superior Court, Iredell County, last week, following in the footsteps of Judge Robinson, disposed of the case of State Railroad Commissioner J. W. Wilson by denying the defendant a trial by jury and holding that the Governor has the right to suspend a commissioner until next session of Legislature for alleged misdemeanor. This case, like that of Commissioner Otho S. Wilson, was at once appealed to the State Supreme Court. In the meantime, until the highest Court passes on the case, the old Commissioners will remain in possession of the office.

Steamboat New York Lengthened Thirty Feet.

The steamboat New York, of the Albany Day Line, is now in Erie Basin being lengthened. She was formerly 311 ft. long, but has been cut in two in the middle and 30 ft. inserted, making her 341 ft. long. By these changes one more water-tight compartment has been secured.

South American Notes.

A vein of iron ore, conforming to the Bessemer standard, 200 ft. wide and over 5 miles in length, has been located near Santa Catalina, Venezuela, by the Orinoco Mining Co. Other veins of similar ore are said to exist in the same vicinity.

An attempt will soon be made to export meat from Puerto Cabello, Venezuela, to England in refrigerator ships. The cattle of the Venezuelan plains are said to be superior to those from Australia, and yet command a lower price.

The Tacnira Railroad in Venezuela is rapidly being pushed to completion. A large steel bridge over the River Lobaterita on this line is now being built.

The returns from the National Andine Railroad (Argentina) for the first half of 1897 show a net profit of $209,283, a slight decrease from the figures for the corresponding period of 1896. The train miles run were 114,418, and car miles 2,057,153, on 211 miles of line. The passengers carried averaged 189 per diem, showing a certain determination on the part of the traveling public to cross the Andes at this point in spite of obstacles. The working expenses of the road were 62.15 per cent. of the receipts.

The project for leasing the State Railroads in Argentina has received a temporary set back by the report of the President of the National Railroad Board, in which he claims that an improvement in rolling stock would enable these lines to be operated at a profit, a statement which is very generally discredited by those most familiar with the "gratificaciones" enjoyed by the politicians at the expense of the state roads.

The new Chilian Minister of Public Works is taking hold of the railroad problem in earnest, and seems bent upon useful reforms. He has ordered the Director-General of the State Railroads to prepare estimates in the shortest possible time for the equipment of all freight cars with air-brakes, for constructing enclosed and roofed sheds for coal and for rolling stock in Valparaiso, Santiago, Talcahuano, San Rosendo, Concepcion and a few other stations. These improvements are in conformity with recommendations of the Director General, but governmental support has been wanting for their prosecution. An estimate of the cost of permanent way, rolling stock, etc., is also to be made on a uniform basis of currency, a task of no little difficulty considering the many changes in the currency standard during the existence of these roads. Until it is done, however, it is difficult to ascertain what financial return on the investment these state lines are yielding.

The collapse of the Nitrate Combination will probably have a most important influence upon the development of Chilean industries, particularly through the inevitable failure of the weaker nitrate companies and the inability of the government to effect a sale of additional nitrate lands. The increasing production of ammonium nitrate from by-product coking is also becoming seriously felt in Chile. The government is using strenuous efforts to stimulate mining operations, and has recently granted a subvention to the Mining Institute of Copiapo for the purpose of aiding the development of the mineral industry. Subventions are also offered for the production of iron in Chile. Under such circumstances it is unlikely that the government will do much more than encourage the extension of the "rural railroads," leaving the ill-fated Trans-Andine road to languish a while longer.

From Peru come advices that congress has passed the first article of the bill authorizing the government to negotiate with the Peruvian Corporation, Limited, for a settlement of the matters in dispute between them, but it is considered doubtful whether the bill as a whole will pass.

At a meeting recently held in London the holders of Ecuadorian bonds agreed to accept the proposal of the Guayaquil & Quito Railroad to make a cash advance payment of £2 10s. on bonds deposited at once, in accordance with the terms of the concession under which this company is operating. The company, which is an American concern, comprising in its directory Messrs. Stuart Coats, G. Hope Norton, J. C. Kilbreth, Archer Harman, Douglas Robinson, George Hoadley, Robert M.

Thompson and others well known in financial circles, has undertaken to purchase the existing railroad from Guayaquil to Chimbo, and continue the line to Quito, with certain branches, making 300 miles in all. Its concession provides for issuing bonds to the amount of $12,282,000 and stock to a like amount, consisting of $5,250,000 preferred and $7,032,000 common stock. The preferred stock has a first claim to interest at seven per cent. out of the earnings, but the concessionaires may waive, and actually have waived, this right in favor of the bonds. The bonds are secured by mortgage on the railroad and by the customs revenue of Ecuador, less small sums pledged out of this revenue for other purposes. This renders about $1,600,000 available annually to meet interest at six per cent. and sinking fund for the extinction of the debt in 1902. The company has deposited $500,000 gold as a guarantee of good faith. The estimated cost of the road is $16,782,000, to which must be added $750,000 to be paid for the existing section of 65 miles in length.

Railroad Lectures at Purdue.

Mr. M. E. Ingalls, President of the Cleveland, Cincinnati, Chicago & St. Louis, will deliver a lecture to the students at Purdue University on Monday evening, Nov. 22. The subject will be "Railways; their Past, Present and Future," and the lecture will be public. Mr. J. T. Brooks, Vice President of the Pennsylvania Company, delivered a lecture this week at Purdue on "Problems in the Management of a Railway," which was also a public one.

The Pullman Company.

Robert T. Lincoln is to be Acting President of the Pullman's Palace Car Company until a President is elected. The Executive Committee of the Pullman Company held a meeting Nov. 11, and chose Mr. Lincoln Chairman to fill the vacancy. This committee was appointed to have general charge of the affairs of the company: H. C. Hulbert, Robert T. Lincoln, and Marshall Field. The Committee then elected Mr. Lincoln Chairman, and to act as President of the company.

A Railroad That Lifts Itself by Its Boot Straps.

In Halford's patent railway the motive power is gravity, and the cars are always running down hill. This result is achieved by making the permanent way in sections, hinged together and supported at each end on hydraulic rams. As the train reaches the junction of two sections, it puts the hydraulic machinery in action, so that the ram rises, lifting the end of the section together with the cars that are upon it. The train thus has a decline, down which it runs by its own weight, and as the same process is repeated with each section it is practically always running down a falling gradient, continuous, though of varying steepness. The necessary hydraulic power is conveyed through a pipe laid beneath the rails, and the admission of water to the cylinders of the rams is controlled either by electrical means from the cars or by the weight of the train depressing the section it is about to leave, and thus actuating the supply valve.—*The London Times.*

LOCOMOTIVE BUILDING.

The Iowa Central is in the market for two new switching locomotives.

The Centralia & Chester Railroad is in the market for one or two new locomotives.

The Baldwin Locomotive Works are building one locomotive for the Norfolk, Virginia Beach & Southern.

It is rumored that the Ann Arbor will soon order from 6 to 10 locomotives, but the New York office denies the report.

The Fitchburg Railroad has placed an order with the Schenectady Locomotive Works for three compound locomotives.

The Baldwin Locomotive Works have built and delivered to the West Virginia Central & Pittsburgh one freight engine.

The Union Pacific, Denver & Gulf has placed an order with the Baldwin Locomotive Works for five consolidation locomotives They will have 19 × 26 in. cylinders, 51-in. driving wheels, boilers 62 in. in diameter, tank capacity 4,200 gals., and weigh 138,000 lbs.

The Brooks Locomotive Works, of Dunkirk, N. Y., are building one six-wheel connnected side tank locomotive for the Sanuki Railway, of Japan. It will be a 42-in. gage and weigh 60,000 lbs. in complete working order. The cylinders will be 14 × 18 in., driving wheels 36 in. in diameter, straight top boiler 45 in. in diameter, 124 tubes 1¾ in. in diameter and 8 ft. 4 in. long, with a copper firebox 60⅛ × 23⅛ in.

According to newspaper dispatches from St. Petersburg, the Russian Locomotive Construction Co. has been authorized by the Russian government to place orders for 400 locomotives abroad. In our issue of March 26 we explained that the Russian government would require a large number of locomotives, but no contracts would be given to firms outside of Russia unless the Russian government was forced to through lack of facilities at home.

The Brooks Locomotive Works, of Dunkirk, N. Y., have received an additional order from the Buffalo, Rochester & Pittsburgh for one 10-wheel passenger engine to be an exact duplicate of the one recently furnished that company, and for four consolidation freight locomotives for the same road. The latter will have 18 × 26-in. cylinders, 58-in. improved Belpaire boilers, 108 × 33 in. fireboxes, 212 tubes, 2 in. in diameter, 13 ft. 2 in. long and 48-in. drivers. They will weigh in working order 131,000 lbs., carry 180 lbs. of steam and be furnished with Jerome packing, Midvale tires, Monitor injectors, Nathan lubricators and New York automatic driving wheel brakes.

The Cleveland, Cincinnati, Chicago & St. Louis has, as mentioned in this column last week, ordered one consolidation locomotive from the Richmond Locomotive Works. This engine is to be delivered about Dec. 10, and will be given a thorough trial in all classes of freight service. If it meets the requirements of the road for this class of engine, it is intended to make it the standard type of freight engine, and other engines of the same class will be ordered as needed. The sample engine will have cylinders 20 in. × 26 in., driving wheels 51 in. in diameter, and a weight in working order of 133,000 lbs. on drivers, and a total weight of 150,000 lbs. The boiler will be extended wagon top, and the steam pressure 190 lbs. The driving wheel centers, steam chest, piston rods and pistons will be of cast steel. The trucks will be Fox pressed steel, 80,000 lbs. capacity; the axles will be steel, and Westinghouse pumps, American brakes, Curtis automatic sanders and Monitor injectors, made by the Nathan Mfg. Co., will be used.

CAR BUILDING.

The Wells & French Co. is building four cars for the Central Commercial Co.

The Washburn & Moen Co., of Worcester, Mass., is in the market for 150 box cars.

The New York, New Haven & Hartford is reported as in the market for 500 coal cars.

The Illinois Central has placed an order with the St. Charles Car Co. for 250 box cars.

The Iowa Central is in the market for 150 box and four passenger and two chair cars.

The Union Pacific, Denver & Gulf is in the market for 300 34-ft. box cars of 60,000 lbs. capacity.

The Pittsburgh & Lake Erie is again reported in the market for cars, this time for 500 box cars.

The Centralia & Chester Railroad is in the market for 100 coal, 30 box, and one or two passenger cars.

The Barney & Smith Car Co., of Dayton, O., is building 50 cars for the Colorado & Northwestern Railroad.

The Michigan-Peninsular Car Co. is building 100 freight cars for the Chicago & West Michigan Railroad.

The Georgia Railroad is having 25 cars built at the works of the Ohio Falls Car Mfg. Co., at Jeffersonville, Ind.

The Lima Locomotive & Machine Works, of Lima, O., are building 100 cars for the Atlantic & Danville Railroad.

The Michigan-Peninsular Car Co. is building 100 more freight cars for the Consolidated Rolling Stock Co., of Bridgeport, Conn.

The New York Central & Hudson River Railroad is to build 10 freight cars at its West Albany shops, which will have a capacity of 100,000.

Murray, Dougall & Co., of Milton, Pa., are building five freight cars for the West Virginia, Central & Pittsburgh Railroad and two for the Empire Oil Works.

The Ohio River & Lake Erie Railroad, referred to in our Railroad Construction column in this issue, will place contracts for new equipment in the near future.

We understand that the Canadian Pacific is considering building 50 new passenger cars early next year. This is in addition to the 12 referred to in our last issue.

The contract for 200 box cars for the Minneapolis & St. Louis, referred to last week, will probably not be let for some weeks, as the cars are not to be delivered until next June.

It is generally understood that the Columbus, Hocking Valley & Toledo will soon order more cars, but the Receiver informs us that the report is premature and unauthorized.

The Harlan & Hollingsworth Co., of Wilmington, Del., has been awarded a contract to build six sleeping, six first-class passenger and two baggage and guard cars for a railroad in South America.

We are informed by an official of the Baltimore & Ohio that no contract has been closed with the Southern Iron Car Co. for the lease of 1,500 box cars and 500 coal cars from that company, as recently reported by a railroad paper.

It is reported that the contract for the 200 box cars for the Kansas City, Fort Scott & Memphis has been awarded to the St. Charles Car Co., of St. Charles, Mo., but that firm had not received the order up to the time of going to press.

In our issue of Oct. 29 we referred to an order for 300 box cars given to the Haskell & Barker Co., by the Chicago Great Western. The number has been increased to 1,000 and a contract for the entire amount given to Pullman's Palace Car Co.

In our issue of Nov. 5 we referred to an order for 13 passenger and mail cars and 300 coal cars, given by the Omaha, Kansas City & Eastern. These will be built by the St. Charles Car Co., of St. Charles, Mo., instead of the Pullman's Palace Car Co., as stated.

The Harlan & Hollingsworth Co., of Wilmington, Del., has finished building a new car for the United States Fish Commission to be used for the carrying and propagation of young fish. It is 69 ft. long and 9 ft. 6 in. wide and fitted with necessary tanks, hot water heaters and other conveniences.

The Long Island Railroad will ask for bids within the next 10 days or two weeks on 20 combination cars, to be 57 ft. long, with 20-ft. compartments. Pintsch gas and steel tired wheels are among the specifications. These cars will be built for the accommodation of bicyclists, of which the road carried, during the past season, more than 150,000.

In our issues of Oct. 29 and Nov. 12 we referred to some special features in connection with the 1,000 cars recently ordered by the Norfolk & Western. The following are called for in the specifications: Chicago roofs, Wagner side doors, Maguire grain doors, Sterlingworth brakebeams, Westinghouse brakes, and 500 to be equipped with Hein and 500 with Tower couplers.

Reports have appeared in a large number of the papers to the effect that the Atchison, Topeka & Santa Fe has placed orders for a number of new cars. In our issue of Oct. 22 we noted an order for 100 refrigerator cars with the Wells & French Co. The road is building a number of box cars at its Topeka shops which are 34 ft. long and of 60,000-lbs. capacity. No definite arrangements have been made for other cars.

The Schoen Pressed Steel Co., of Pittsburgh, Pa., has received an order to build 400 more steel cars for the Pittsburgh, Bessemer & Lake Erie Railroad, 300 from the design worked out by Mr Chas. T. Schoen and 100 from designs of the Carnegie Steel Co. All of these cars will be furnished with Schoen Pressed Steel Co.'s diamond pressed steel truck. In other respects the cars will be similar to the 600 built for the same road and described in our issues of Feb. 26 and April 2.

The dining car ordered by the Cleveland, Cincinnati, Chicago & St. Louis from the Barney & Smith Car Co., of Dayton, O., and mentioned last week, will have a length over sills of 70 ft. and the two parlor cars of 65 ft., while the four horse express cars will be 55 ft. long. The dining and parlor cars will have six-wheel steel-tired trucks, Big Four standard, and will be heated by the Gold system and lighted by Pintsch gas and supplied with double windows and the Buhoup wide vestibules. The interior finish will be in mahogany with inlaid decoration. The parlor cars will have steel platforms and will be provided with buffet, smoking room, ladies' room and curtained sections for pleasure parties, writing desks and revolving chairs.

BRIDGE BUILDING.

Cincinnati, O.—It is said that the County Commissioners have given the contracts for a wrought-iron truss bridge over Taylor Creek, at Fowler's, and for a bridge over West Fork of Mill Creek, on Miles road, to the Brackett Bridge Co., at $2,950 and $1,745 respectively.

Easton, Pa.—The bids received by the County Commissioners for a bridge over Jacobus Creek, in Bushkill township, have been rejected, and new bids will be advertised for.

Flushing, N. Y.—It is said that the town has decided to replace the wooden bridge on the Flowerville causeway, near Ireland Mills, with an iron structure, to cost about $5,000.

Indiana, Pa.—The attention of the County Commissioners has been called to the unsafe condition of the bridge across Two Lick Creek at Upper Two Lick.

Indianapolis, Ind.—Bridges over the White River, at Raymond and Ray streets, have been petitioned for, and the County Commissioners are considering the question of building the former.

Los Angeles, Cal.—The California Southern, it is said, will soon build a steel viaduct across one end of the Alhambra Valley, in Contra Costa County. A. A. Dougherty, of this place, is President.

McConnellsburg, Pa.—The contract for an iron bridge over Tonoloway Creek at Deneen's Gap has been given to Nelson & Buchanan, at $1,200.

Marietta, O.—The Marietta & Williamstown Bridge Co., which is to build a railroad and highway bridge over the Ohio River at this place, has completed all its plans, and will exhibit them for the criticism of Ohio River navigation interests at Cincinnati this week. The plans have been accepted by the Secretary of War, provisionally, and when the local engineers and rivermen have decided upon what changes they desire a final hearing will be given. It is the desire of the company to get to work not later than early spring. T. D. Dale, of Marietta, O., and C. C. Jutte, of Pittsburgh, Pa., are the chief owners of the company's stock.

Mehoopany, Pa.—The Grand Jury has decided that a county bridge across the Susquehanna River between here to Washington is necessary.

Middletown, O.—It is said that two new bridges will be built across the canal in the spring.

New Brighton, Pa.—The Penn Bridge Co., of Pittsburgh, has received the contract to build a bridge between here and Beaver Falls, at a cost of $70,000.

New Castle, Pa.—The Pittsburgh & Lake Erie, it is said, has decided to build a bridge across the Shenango River at the new tin mill at this place.

Ottawa, Ont.—The new Nepan Point bridge, toward which the government has promised $150,000, will be 1,800 ft. long, exclusive of approaches. It is expected that tenders will be invited in the course of a few days.

Portland, Ore.—It is said that three iron bridges have been ordered from the Portland Bridge Co. for a wagon road which is being built from Skaguay to Lake Bennett, in Alaska.

Toledo, O.—The contract for the steel work of the Cincinnati, Hamilton & Dayton's new bridge has been given to the Toledo Bridge Co.

Washington, Ind.—An appropriation of $18,375 has been voted for two bridges across West White River.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Chestnut Hill, quarterly, 1½ per cent., payable Dec. 4.
Cleveland & Pittsburgh, quarterly, guaranteed, 1¾ per cent., payable Dec. 1.
Columbia & Western, 4 per cent., payable Nov. 15.
Mexican Northern, quarterly, 1 per cent., payable Nov. 30.
North Pennsylvania, quarterly, 2 per cent., payable Nov. 24.
Philadelphia, Germantown & Norristown, quarterly, 3 per cent, payable Dec. 4.

Danbury (Conn.) & Bethel Street, 2 per cent., payable Nov. 15.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds its formal meetings on the third Wednesday of each month, from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Chicago Electrical Association* meets at Room 1737 Monadnock Building, Chicago, on the first and third Fridays of each month, at 8 p. m. J. R. Cravath, Secretary.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Civil Engineers' Society of St. Paul*, meets on the first Monday of each month, except June, July, August and September.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Engineers' Club of Columbus, (O.)*, meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Locomotive Foreman's Club* meets every second Tuesday in the clubroom of the Correspondence School of Locomotive Engineers and Firemen, 335 Dearborn street, Chicago.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *North-West Railway Club* meets on the first Tuesday after the second Monday in each month, at 8 p. m., the place of meeting alternating between the West Hotel, Minneapolis, and the Ryan Hotel, St. Paul.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *St. Louis Railway Club* holds its regular meeting on the second Friday of each month, at 3 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. A. Sorge, Jr., 1533 Marquette Building, Chicago, is secretary.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736 1739 Monadnock Block, Chicago.

Engineers' Society of Western New York.

The regular monthly meeting of this Society was held in the Library Building, Nov. 9, at which Mr. Newcomb Carlton read a paper, "The Northern Elevator and the Application of Electricity to its Operation, as well as to other mechanical appliances."

New York Railroad Club.

At the meeting of the New York Railroad Club, which was held on Oct. 21, Mr. W. B. Potter being unable to present his paper on the "Engineering Side of the Application of Electricity to Standard Railroading," a topical discussion was held on the same subject also a discussion on the height of drawbars. At the meeting of the Club which was held last evening Mr. R. A. Parke read a paper on "The Effect of Brakebeam Hanging upon Brake Efficiency."

North-West Railway Club.

The regular meeting of the North-West Railway Club was held at the West Hotel, Minneapolis, Nov. 9. Discussions were held on Mr. Hemstreet's paper on "Boiler Feed Waters and Incrustations," and Mr. Conolly's paper on "Soft Metal Linings for Locomotive and Car Journal Bearings." Mr. Geo. Dickson, General Foreman of the Great Northern, St. Paul, gave the results of further experiments on "Firebox Steel" which had been heated a number of times and cooled in water, some of the samples being cooled in hot and some in cold water. This paper also provoked a very lively discussion which will be continued at the next meeting.

Western Railway Club.

The regular monthly meeting of the Western Railway was called to order at 2 p. m. on Tuesday, Nov. 16, in the Auditorium Hotel, Chicago. The paper on "Heating Passenger Cars," by Mr. William Garstang, which was put over from the October meeting on account of the long discussions on the other subjects, was presented. The subject, "Is it Desirable to Corrugate or to Cup Locomotive Firebox Sheets?" which also was put over from the October meeting, was likewise discussed. Ten-minute discussions were held on the following subjects: "How Much Variation in the Height of Drawbars is it Possible to Make by Track Conditions?"—this subject is suggested by the reports to the Interstate Commerce Commission of drawbars on loaded cars being 37 in. or more above top of rail—and "What is the Correct Interpretation of Section 12, Rule 5, Rules of Interchange."

The Civil Engineers' Club of Cleveland.

A regular meeting of this club was held in Case Library on Nov. 9, with President Ritchie in the chair. A paper entitled "Visits to Some Scientific Institutions in Europe" was presented by Prof. Edward W. Morley. In his paper Professor Morley gave an interesting account of recent visits made to some of the noted scientific institutions of the Old World. In Berlin the Reichs-Anstallt received the most attention, a general description of the apparatus contained therein and of the nature of the work that is done there, being given. In Paris the Sorbonne, the Society des Arts et Metiers, the International Bureau of Weights and Measures, and the laboratory of Littman, in which photographs were produced in their original colors for the benefit of the visitor, were described. The visits to the English institutions, with a description of the apparatus and of some of the experiments now being performed in the laboratory of Lord Rayleigh, closed the paper.

Engineers' Club of St. Louis.

The Club met November 3, with President Flad in the chair. Thirty-three members and three visitors were present.

The paper of the evening, by Mr. F. F. Harrington, entitled "Underground Conduits in St. Louis," was read. A short history of the legislation on this subject was given, and the requirements of the final ordinance were set forth. The rules adopted by the Board of Public Improvements in granting permits and the agreements between the different electric lighting companies were given in detail. Then followed a description of the different systems and conduits which have been adopted. A large number of working drawings and specimens of ducts were exhibited. Lantern slides, showing views taken during the construction, were used in explaining the methods adopted.

The discussion which followed the reading of this paper was participated in by Messrs. Wagner, Abbot, Nipher, Reber and McCulloch.

Western Society of Engineers.

A lecture will be delivered by Mr. Isham Randolph, Chief Engineer of the Sanitary District, in Central Music Hall, Chicago, Tuesday evening Nov. 30. The lecture will describe the work of the District in building the Drainage Channel, and will be illustrated by stereopticon views. The proceeds of the entertainment are to be devoted to the uses of the society, chiefly in increasing the library fund. Tickets can be obtained from the Secretary, Mr. Nelson L Litten, or at the box office of the Central Music Hall for three days previous to the lecture. Tickets, 50 cents, 75 cents and $1; boxes special rates.

The Library Committee of the Society has issued a circular asking suggestions from members regarding the library. Each member is requested to send to the secretary of the society the title of one or more books which he considers authoritative in some line of engineering work. Suggestions regarding the library in general or in any detail are also asked. The aim is to give greatest good to the greatest number of members with the funds available.

The Franklin Institute.

Meetings of the Franklin Institute will be held during November and December as follows: On Nov. 16 there was a meeting of the Chemical Section, at which a paper on "Ammonia and its Sources" was read by Dr. Bruno Terne. On Nov. 17 a meeting of the Institute was held, at which Mr. Chauncey N. Dutton read a paper on "Pneumatic Locks for Canals." The speaker illustrated the subject by a large working model of the Dutton pneumatic lock, with drawings of the proposed Cohoes locks (140 ft. lift) and of the Lockport locks (62½ ft. lift), etc. Mr. Wm. C. Henderson also presented a paper on "Cryolite; its Mining, Preparation and Utilization." This covered the history of one of the most remarkable mineral occurrences in the world. Mr. Henderson's paper was fully illustrated. On Tuesday, Nov. 23, at 8 p. m., there will be a meeting of the Electrical Section. Mr. Wm. E. Harrington will consider "Railway Bonding," and Mr. J. Lester Woodbridge will read a paper on "The 'Booster' System as Applied to Electric Railways."

On Friday, Nov. 19, Prof. W. B. Scott, of Princeton, gave an illustrated lecture on "The Princeton Expedition to Patagonia." On Friday, Nov. 26, Mr. Allen R. Foote will lecture on "The Right of Property in an Idea." On Friday, Dec. 3, Mr. H. C. Mercer, Curator of the Section of American and Prehistoric Archæology, University of Pennsylvania, will deliver an illustrated lecture on "The Tools of the American Pioneer," and on Friday, Dec. 10, Prof. Albert R. Leeds, Stevens Institute of Technology, will lecture on "Organisms that Produce Tastes and Odors in Potable Waters." Special attention is called to the arrangements provided for securing reserved seats for the Association Hall Course.

Engineers' Club of Philadelphia.

A business meeting of the Club will be held on Saturday, Nov. 20. The paper will be "Some Practical Applications of the 'Mass Curve' in Earthwork Computations." By Prof. Walter L. Webb.

At the stated meeting, held Nov. 6, President Joseph T. Richards in the chair, the paper of the evening was presented by Mr. Benjamin Franklin on "Some Features of Stone Road Construction." His discussion considered three details of the general subject, namely, the use of clay or loam as a binder on stone roads, the thickness of stone roads, and the comparative merits of macadam and telford roads.

Although the specifications in many localities permit the use of clay, gravel and loam for binding purposes, the former as a binder possesses two prominent disadvantages. It is a lubricant, reducing friction between stones, and it also absorbs a large percentage of moisture, changing in bulk and consistency under varying conditions of weather and temperature. Used as a surface binder, it quickly makes a road muddy after a storm, causing ruts in spring and dust in summer. From the contractor's standpoint, however, the use of clay is desirable, since it packs quickly and saves rolling, giving to a road when first built a smoothness and finish at comparatively slight cost. It is barely possible that a little might not be objectionable, but the tendency of the contractor is to use it with great freedom of judgment.

The use of unassorted stones, not too large or hard, and with a sufficient amount of chips or screenings to fill the voids, if properly wetted and rolled during construction, will give a firm, solid road, and one that will be dryer in wet weather, will show better wear, and give more satisfaction in all seasons than a road in which foreign material has been used.

While, in the early days of stone-road building, a thickness of nearly 2 ft. was considered necessary for ordinary travel, experience has reduced this, until at present, with the use of heavy steam rollers, excellent and economical roads of only 6 or 8 in. thickness can be built upon well-drained earth foundations. It has been proven that upon a bed of proper character a core of coarse sand or fine gravel, when covered with a layer of thoroughly-compacted stone only 4 or 6 in. thick, will form a firmer and more lasting surface than a much greater thickness of stone road laid on a costly stone foundation.

American Society of Mechanical Engineers.

The American Society of Mechanical Engineers will hold its annual meeting in New York City, Nov. 30 to Dec. 3. The convention will open at nine o'clock Tuesday evening, Nov. 30, at the Society's house, 12 West Thirty-first street, when Mr. Worcester R. Warner, the President, will deliver an address to be entitled "The Evolution of the Telescope." Wednesday morning at 10 o'clock there will be a business session of the annual meeting to receive reports of officers and committees. At this session the committee on the revision of the 1885 code for conduct of boiler trials, etc., will report. Until the hour of adjournment this session will be filled in with professional papers. There will be no afternoon session on Wednesday or any other day of the meeting, this time being left free for the members to visit points of interest or for social intercourse.

On Wednesday evening there will be a reception at Sherry's. Thursday morning, Thursday evening and Friday morning there will be sessions of the convention. A list of the papers to be presented at the various sessions follows:

Christie, W. W. Boiler Tests; Classification of Data and Plotted Results.
Dean, F. W. Reduction of Cost of Steam Power from 1870 to 1897
Carpenter, R. C. Tests of Centrifugal Pump and Calibration of Weir at the Bridgeport Pumping Station, Chicago.
Stillman, Howard. A Water Purifying Plant.
Thurston, R. H. Multiple Cylinder Engines. Effects of Variation of Proportions and Variable Loads.
Aldrich, W. S. Notes on Rating Electric Power Plants on the Heat-unit Standard.
Keep, Wm. S. Cast-Iron Under Impact.
Mayo, John B. A Strength of Gear Chart.
Guelbaum, David. A Law of Hydraulic Obstruction of Flow in Pipes.
Richmond, George. Thermodynamics without the Calculus.
Norris, H. M. An Accurate Cost-keeping System.
Main, Chas. T. The Valuation of Textile Manufacturing Property.
Smith-Whaley, W. B. Electricity in Cotton Mills.
Hartness, Jas. Screw-die for the Turret Lathe.
Hartness, Jas. Stay-bolt Threading Device.
Rice, A. L. Convenient Form of Wire Testing Machine.
Woodbury, C. J. H. Dustless buildings.
Fletcher, Andrew. The Stevens Valve-gear for Marine Engines.
Dickie, Geo. W. Auxiliary Engines and Transmission of Power on Naval Vessels.
Bissell, Geo. W. A Boiler Setting.
Mumford, E. H. Machine Molding without Stripping Plates.

Naval Architects and Marine Engineers.

Last week this young but strong and influential society held its fifth annual meeting in New York City at the rooms of the American Society of Mechanical Engineers, which are the permanent headquarters also of the Naval Architects. Mr. John C. Kafer, of New York, formerly of the U. S. Navy and now Superintendent of the Morgan Iron Works, was Chairman of the meeting. The following officers were elected for the year: President, Clement A. Griscom, President International Navigation Co.; Vice-Presidents, Commodore F. M. Bunce, U. S. Navy (to succeed Admiral Meade), T. W. Hyde, President Bath Iron Works and Col. E. A. Stevens, of Hoboken. These are new Vice-Presidents. The following gentlemen were re-elected Vice-Presidents: Charles H. Cramp President William Cramp & Sons; Philip Hichborn, Chief Constructor U. S. Navy; Charles H. Loring, Engineer in Chief U. S. Navy (retired); William H. Webb (honorary member); George W. Melville, Engineer in Chief U. S. Navy; George W. Quintard, Quintard Iron Works; Irving M. Scott, General Manager Union Iron Works, San Francisco, and Frank L. Fernald, Naval Constructor U. S. Navy. The following were added to the members of the Council: W. M. McFarland, Past Assistant Engineer U. S. Navy, and C. H. Peabody, Professor Marine Engineering and Naval Architecture, Massachusetts Institute of Technology. Mr. Francis T. Bowles, Naval Constructor U. S. Navy, was re-elected Secretary and Treasurer.

The list of papers presented at this meeting we have published in a former issue, but repeat it here as follows:

Watertight Bulkhead Doors. The "Long Arm" System on the U. S. S. Chicago. By Wm. Barnum Cowles, Esq., Member.
Regulations for Loading Vessels. By Lewis Nixon, Esq., Member.
Torpedo Boat Design. By Ass't Naval Constructor H. G. Gillmor, U. S. Navy, Associate.
The Commerce of the Great Lakes. By C. E. Wheeler, Esq., Member.
Progressive Trials of the Guardian. By Prof. C. H. Peabody, Member.
An Experimental Study of the Influence of Surface upon the Performance of Screw Propellers. Preliminary Paper. By Prof. W. F. Durand, Member.
Some Notes on the Speed Trials and Experience in Commission of our New Battleships. By Chief Constructor Philip Hichborn, U. S. Navy, Vice-President.
Performance of Scotch Boilers and their Durability under Forced Draught. By Edwin S. Cramp, Esq., Member.
Use of Water Ballast for Colliers in the Pacific Coast Trade. By Wm. P. Frear, Esq., Member.
Estimated Weights of Machinery. By Prof. Geo. R. McDermott, Member.
Navy Yard Expenses. By Naval Constructor W. J. Baxter, U. S. Navy, Member.
Pneumatic Steering Gear, as applied to the U. S. monitor Terror. By H. A. Spiller, Esq., Member.

Among the guests was Mr. A. F. Yarrow, of Poplar, Isle of Dogs, London, the famous builder of torpedo boats and light draft steamers.

The papers presented were of uniformly high excellence and there was much important discussion. Brief extracts from some of these papers we publish on another page.

The annual dinner of the society was held at Delmonico's, about 100 members and guests being present and Col. E. A. Stevens as toast master. Among the guests at the dinner were Mr. Theodore Roosevelt, Assistant Secretary of the Navy; Mr. Yarrow and Captain Mertage, Russian Naval Attache. Mr. Roosevelt spoke at considerable length on the needs of the navy, and Mr. Yarrow spoke very kindly of the hospitality that he had received and the interest that he had found in his visit to this country.

RAILROAD LAW—RECENT DECISIONS.

In Illinois a railroad company which for seven years has occupied land as part of its right of way, under a conveyance taken in good faith, during which time it has kept it fenced and has paid all taxes against it, is the legal owner of such land, and an action to recover possession thereof cannot be successfully maintained, although the plaintiff proves a title paramount to that of the company's grantor (decided in the Supreme Court, April, 1897).[1]

In New Hampshire, a man was driving on a street running almost parallel to a railroad track and finally crossing it. The portion of the street available for driving was made narrow by snow banks, so that it would have been somewhat difficult for him to turn around. His horse was somewhat afraid of moving trains, especially when they came abreast of him and especially also when they approached from the rear. When about 120 ft. from the crossing the man became aware of a train about 600 ft. from the crossing and approaching it at the rate of 30 or 35 miles an hour. He deliberately whipped up his horse and attempted to cross ahead of the train. His sleigh was struck and he received fatal injuries. On proof of this state of facts a verdict was rendered against the railroad company and on appeal the court declined to disturb the verdict on the ground that the plaintiff had not necessarily and as a matter of law been guilty of negligence contributing to the injury. It was for the jury to say whether, under the circumstances, a prudent man would have taken such a risk (decided in the Supreme Court July, 1897).[2]

In Iowa, the rules of a railroad company provided that whenever a violent storm prevailed, track foremen should immediately on the occurrence of such a storm take their men and proceed over their sections, and if any place was found unsafe flag approaching trains. A storm having blown a limb upon the track, a locomotive caught it up and carried it into another section, where it derailed the train, killing the fireman. His representative sued the company for damages. The accident had occurred about 40 minutes after the storm commenced. Within a little more than 20 minutes after it commenced, but after the train had passed the section where the branch was caught up, the trackmen were out inspecting the section. It is held that the company was not negligent in not causing the section to be examined

in advance of the coming of the train and that the plaintiff could not recover (decided in the Supreme Court, October, 1897).[2]

In Maine an indictment against a railroad corporation for negligently causing the death of a person is declared to be no longer maintainable. The sole remedy now is in a civil suit for damages (decided in the Supreme Court, May, 1897).[4]

In an action brought in the same state, it appeared that, in alighting from one of a street railroad company's cars in the evening, a short distance from a street crossing, the plaintiff, a vigorous young woman, stepped on a rolling stone lying in the street, between the car and the sidewalk, and broke her ankle. She recovered a verdict for negligence imputed to the company because of the failure of the conductor to stop the car at the crossing and of his invitation and proffered assistance to alight at the point where the car did stop. This verdict was set aside on the ground that the conductor, for failure to stop the car exactly at the crossing, cannot be deemed legally culpable, nor was the place of alighting so unsuitable as to render it actionable negligence to permit the woman to leave the car either with or without assistance (decided in the Supreme Court, April, 1897).[5]

In Rhode Island it is held that where an employee proves that he was injured by reason of the imperfect welding of a brake-rod, he cannot recover if the evidence of the company shows that by reason of rust the defect was not discoverable by the usual method of inspection, unless he shows to the satisfaction of the jury that the company's methods of inspection were not reasonable (decided in the Supreme Court, July, 1897, one judge dissenting).[6]

In Pennsylvania, it is held that an adult, with the enses of sight and hearing unimpaired, who, attempting in broad daylight to cross the three tracks of a railroad, is struck by a train on the last track, is guilty of such negligence as will defeat a recovery, where she had an unobstructed view of the track on which it was approaching for 70 feet before she went on the first track, for 224 ft. before going on the second track, and for 900 ft. before going on the third track (decided in the Supreme Court, July, 1897).[7]

It is held in New Jersey that a person who dedicates land to public use as a highway may in such dedication reserve to himself and his assigns the right to construct and operate a railroad therein. When such reservation is made the public takes the highway subject thereto. Accordingly, where the original owner grants his right to construct the railroad to a railroad company, a property owner whose land abuts on the land so dedicated cannot object to the validity of an ordinance authorizing the construction (decided in the Court of Appeals, July, 1897).[8]

It is decided in Indiana that the fact that a person received a severe nervous shock, was so greatly frightened as to cause her to faint, and her life was put in imminent peril and that she had suffered great mental pain and anxiety by reason of the wrongful act of a railroad company in causing a horse attached to a buggy in which she was riding to run away, is not a sufficient basis for the recovery of damages. Mental suffering when joined with physical injury may be considered in estimating damages. It cannot, however, constitute a distinct ground for recovery (decided in the Court of Appeals, September, 1897).[9]

[1] C., M. & St. P. v. Grant, 47 N. W., 750.
[2] Folsom v. C. & M., 38 Atl., 209
[3] Cox v. C. & N. W., 72 N. W., 301.
[4] State v. Maine Cent., 38 Alt., 158.
[5] Conway v. Lewiston & A. Horse R. Co., 38 Alt., 110.
[6] Read v. N. Y., N. H. & H., 37 Alt., 947.
[7] Baker v. Pa., 37 Alt., 933.
[8] Fallon et al. v. Mayor, etc. of Hoboken et al., 37 Alt., 895.
[9] Kalen v. T. H. & I., 47 N. E., 694.

PERSONAL.

—Mr. George S. Wilkins has been appointed Consulting Engineer of the Alabama Railroad Commission.

—Mr. Robert Delahay, Traveling Auditor of the Chicago, Rock Island & Pacific, died suddenly at Smith Center, Kan., Nov 10.

—Mr. B. F. Masson, Traveling Passenger Agent of the Cincinnati, Hamilton & Dayton, with headquarters at Toledo, O., has resigned.

—Mr. Spencer R. Atkinson, of Glenn, Ga., has been appointed a member of the Georgia Railroad Commission to serve for six years.

—Mr. David P. Kimball, of Boston, Mass., State Director of the Fitchburg, has resigned. No successor to Mr. Kimball has yet been chosen.

—Mr. F. J. Ferry, Master Mechanic of the Louisville, Henderson & St. Louis, with headquarters at Cloverport, Ky., died at his home at that place Nov. 4, aged 52 years.

—Mr. John C. Bullitt, Jr., who for several yeart prior to its reorganization was Assistant Counsel for the Northern Pacific, at St. Paul, Minn., committed suicide in New York City Nov. 12.

—Mr. Charles W. Reiff, Traveling Passenger Agent of the New York, Philadelphia & Norfolk, died at his home in Philadelphia from typhoid fever Nov. 9. Mr. Reiff was 39 years old and had been in the service of the company for nearly 20 years.

—Col. John Jameson, General Manager of the Union Subway Construction Co., in New York City, died at his home in Brooklyn, N. Y., Nov. 14. In 1884 Colonel Jameson was General Superintendent of the Railway Mail Service under President Arthur.

—Mr. Myron T. Herrick was elected President and Mr. Robert Blickensderfer Vice-President and General Manager of the Toledo Belt Railway at the annual meeting of the company held Nov. 9. Messrs. Herrick and Blickensderfer are the Receivers of the road.

—Mr. William C. Bullitt, Traffic Manager of the Norfolk & Western, with office at Roanoke, Va., has resigned, his resignation to take effect Nov. 30. Mr. Bullitt has been in the service of the Norfolk & Western since 1884, being successively Assistant to the President, Vice President and Traffic Manager. For eight years following March 1, 1885, he was also President of the Pocahontas Coal Co.

—Mr. Charles H. Phinizy, who for 18 years has been President of the Georgia Railroad & Banking Co., with office at Augusta, Ga., has resigned, and has been succeeded by Mr. Jacob Phinizy, of Augusta. Bes des holding the above office, Mr. Phinizy was President of the Atlanta & West Point from 1888 until 1894, and President of the Western Railway of Alabama from 1889 until 1894.

—Mr. E. W. Grieves, Superintendent Car Department of the Baltimore & Ohio, with office at Baltimore, Md., has resigned to engage in another business. Mr. Grieves has been in railroad service since 1884, when he became Master Car Builder in charge of car construction and repairs for the Baltimore & Ohio; he held this position until 1894, when he was appointed Superintendent of the Car Department of the same road. Previous to 1884 Mr. Grieves was Chief Draughtsman and Foreman of the Harlan & Hollingsworth Co., of Wilmington, Del.

—Mr. George N. Wilson, Auditor of the Kansas City, Pittsburgh & Gulf, with office at Kansas City, Mo., has resigned. Mr. Wilson graduated as Civil Engineer from the University of Georgia, and in 1886 entered railroad service as Assistant to the Division Engineer of Construction of the Kansas City, Memphis & Birmingham. He remained with that road until 1889, when he was made Freight Accountant of the Kansas City, Fort Scott & Memphis, holding that office until he was appointed Auditor of the Kansas City, Pittsburgh & Gulf, and General Auditor of the Texarkana & Fort Smith on Jan 1, 1893. Mr. R. S. McCarthy, formerly General Manager of the Metropolitan Street Railway Co., of Kansas City, has been appointed Auditor of the Kansas City, Pittsburgh & Gulf to succeed Mr. Wilson.

ELECTIONS AND APPOINTMENTS.

Baltimore & Ohio.—E. W. Grieves, Superintendent Car Department, with headquarters at Baltimore, Md., having resigned, that office has been abolished and its duties will be assumed by the Superintendent of Motive Power.

Charleston & Western Carolina.—W. J. Craig, heretofore General Freight and Passenger Agent, with headquarters at Augusta, Ga., has been appointed General Manager, with headquarters at Augusta.

Chesapeake & Ohio.—L. F. Sullivan, heretofore Auditor, has been appointed Comptroller, with headquarters at Richmond, Va. C. E. Potts, heretofore Cashier, has been appointed Treasurer, with headquarters at Richmond, to succeed the late Thomas Barbour. These appointments took effect Nov. 15.

Chicago & Northwestern.—H. W. Beyers, heretofore General Agent at Cleveland, O., has been transferred to Philadelphia, Pa. Mr. Beyers will be succeeded as General Agent at Clevelaad by D. L. Sturgis, of Racine, Wis.

Cincinnati, New Orleans & Texas Pacific.—John M. Chesbrough, formerly General Passenger Agent for the Baltimore & Ohio Southwestern, has been appointed Traveling Passenger Agent of this company, with headquarters at Detroit, Mich., to succeed C. A. Baird, resigned.

Columbus, Sandusky & Hocking.—W. B. Blanton has been appointed Trainmaster, with office at Fair Grounds Station, Columbus, O., to succeed C. L. Gardner, resigned.

Detroit & Lima Northern.—W. H. Yeazell, heretofore Car Accountant of the Ohio Southern, with office at Lima, O., has been appointed Car Accountant of this company, with office at Tecumseh, Mich.

Duluth, Red Wing & Southern.—At the annual meeting of stockholders, held Nov. 10, at Red Wing, Minn., William Danforth, Jr., was elected a Director to succeed H. E Perkins, deceased.

East St. Louis Connecting.—At the annual meeting of stockholders, held Nov. 8 at East St. Louis, Ill., George L. Sands was elected a Director, to succeed E. C. Newkirk. Philip C. Scanlan was elected Secretary, with headquarters at St. Louis, Mo., to succeed E. C. Newkirk.

Florida Central & Peninsular.—D. K. Houck has been appointed Soliciting Freight Agent, with headquarters at Baltimore, Md., to succeed C. B. Wantz, resigned.

Fort Worth & Rio Grande.—John S. Jones has been appointed Acting Auditor, with office at Fort Worth, Tex., to succeed A. K. Dixon, Auditor and Secretary, deceased.

International & Great Northern.—J. S. O'Flynn, heretofore Freight Claim Agent, with headquarters at Palestine, Tex., has been appointed Assistant Auditor of the company, and the office of Freight Claim Agent has been abolished.

Kansas City, Pittsburgh & Gulf.—R. S. McCarthy has been appointed Auditor, with headquarters at Kansas City, Mo., to succeed G. N. Wilson, resigned.

Mexican National.—W. F. Paton, heretofore Acting General Eastern Agent, at 353 Broadway, New York City, has been appointed General Eastern Agent at that place. C. P. Barrett has been appointed Traveling Passenger Agent, with headquarters at 230 Quincy Building, Chicago, Ill. The above appointments took effect Nov. 1.

Oconee & Western.—At the annual meeting of stockholders, held at the company's office at Empire, Ga., Nov. 9, G. R. K. Smith, of New York City, was elected a director to succeed Frederick De Coppet.

Ohio Southern.—E. B. Farrell has been appointed Car Accountant, with headquarters at Lima, O., to succeed W. H. Yeazell, resigned to accept a similar position with the Detroit & Lima Northern at Tecumseh, Mich.

Plymouth County.—The names of the officers of this road, referred to another column, are as follows: President, John F. Simmons, 1010 Exchange Building, Boston; General Manager, George M. Clarke, Pawtucket, R. I.; Treasurer, Charles H. Killan, Assinippi, Mass.; Engineer, Erastus Worthington, Jr., Dedham, Mass.

Richmond, Petersburgh & Carolina.—At a recent meeting of stockholders Andrew C. Trippe, of Baltimore, Md., was elected a director, to succeed Johnston Mooney, resigned.

Seaboard Air Line.—At the annual meeting of stockholders of the Raleigh & Gaston, held at Raleigh, N. C., Nov. 11, W. W. Fuller, of New York City, was elected a director, to succeed W. R. Tucker. The other directors and officers were re-elected.

At the annual meeting of the Georgia, Carolina & Northern, held Nov. 11 at Atlanta, Ga., R. C Hoffman was elected President and E. St. John Vice-President. John C. Owen, of Atlanta, and M. G. Michael, of Athens, Ga., were elected directors.

At the annual meeting of the Seaboard Belt Line, held Nov. 12 at Atlanta, Ga., R. C. Hoffman was elected President and E. St. John Vice-President.

Southern.—C. A. Baird, heretofore Traveling Passenger Agent of the Cincinnati, New Orleans and Texas Pacific, with headquarters at Detroit, Mich., has been appointed Traveling Passenger Agent for this company, with headquarters at Louisville, Ky.

Toledo Belt.—At the annual meeting of stockholders, held at Toledo, O., Nov. 9, the following directors were elected: Myron T. Herrick, Robert Blickensderfer, Downer Adams, N. H. Swayne and H. J. Booth. Officers were elected as follows: President, Myron T. Herrick; Vice-President and General Manager, Robert Blickensderfer; Secretary and Treasurer, Downer Adams.

RAILROAD CONSTRUCTION,

Incorporations, Surveys, Etc.

Atlantic & Lake Superior.—It is stated that tracklaying has been begun on the Baie des Chaleurs Division and will be completed to New Carlisle in 30 days. The contracts have also been let for the building of the section of the road between Yanaska, Que., and Levis. (See this column for Oct. 22.) The Dominion Bridge Co., of Lachine, has been awarded the contract for building the superstructure and for the bridge over the Nicolet River, the piers, 800 ft. in length, being already completed. The iron work for several bridges on the Baie des Chaleurs Division extension has been awarded to the Hamilton Bridge Co. This road when completed is to extend from St. Mary's River, Ont., to Gaspe Bay, Que., and active work is being done at several points along the line. About 100 miles are now in operation.

California Southern.—It is reported that 18 miles of this road have been graded and about 12 miles of rail laid. It is expected that the entire line will be completed early in December. Ramish & Marsh, Los Angeles, Cal., have the contract for building this road, which is to extend from Kramer, Cal., a point on the Atlantic & Pacific, north 27 miles to Randsburg. A. A. Dougherty, of Los Angeles, is President. (See this column for Oct. 15.)

Chicago, Rock Island & Pacific.—The work of straightening the track and deepening the cut over O'Neill's Hill, between Minae and Walnut, Ia., on the main line a few miles east of Council Bluffs, which has been carried on for about a year, is now practically completed. Over 100,000 yards of dirt were moved in cutting down the hill 8 ft. below the old grade and in elevating the track at the foot of the hill.

Chicago, St. Paul, Minneapolis & Omaha.—Surveyors are at work north of Black River Falls, Wis., locating a cut-off to take the place of a reverse curve which when completed will shorten the line nearly one-fourth of a mile.

Chicago Terminal Transfer.—The Lyons & Chicago, which was incorporated April 21 (see this column for April 30) to build a road from Chicago southwest to Lamont, Ill., in Cook County, has completed about one mile of track and is now being operated by the Chicago Terminal Transfer. The road extends into the quarries of the company at Lamont and further extensions will be made from time to time as business may warrant. The two roads have the same officers, S. R. Ainslie, of Chicago, being President and General Manager.

Cincinnati, Georgetown & Portsmouth.—It is reported that surveys have been completed for the extension of this road from Georgetown, O., southeast about 20 miles to West Union, and that drawings and estimates are now being prepared. (See this column for Oct. 29.) The present road extends from Cincinnati southeast 42 miles to Georgetown. E. W. White, Cincinnati, is Vice President and General Manager.

Colorado Valley.—Seven and one-half miles of road have been completed from Sweetwater, Tex., to the first station, Ada, and the company is now at work on the grading of the next five miles beyond. Sixty-pound rails are used in the track. The road is projected to run from Sweetwater southeast toward San Antonio and Austin. (See this column for Nov. 5.) Irving Wheatcroft, of Sweetwater, Tex., is Vice-President and General Manager.

Des Moines & Kansas City.—The section of this road from Van Wert to Carnsville, Mo., 40.5 miles, has been changed to standard gage. The rest of the road, from Carnsville to Des Moines, 71.5 miles, was changed to standard gage about a year ago.

Hammond, Liverpool & Hobart.—This company has been incorporated in Indiana with a capital of $50,000, to build a line from Hammond southeast 10 miles to Hobart. The incorporators are E W. Eldridge, E. C. Crane, J. C. Williams, John Ingle and G. M. Hauslein.

Illinois Central.—According to report surveys are being made for an extension from Hodgensville, Ky., southeast 25 miles to Greensburg.

Jasper Southern.—Seventeen miles have been graded and 75 men are now at work on this road, which is to extend from Kirbyville, Tex., northwest to Jasper, 20 miles. The grading is easy, the maximum grade being 104 ft. per mile and the maximum curve 5 deg. There are no bridges of importance, but two trestles of about 400 ft. each. The work is being done by the stockholders. W. W. Blake, Jasper, Tex., is Chief Engineer. (See this column for July 9.)

Kingston & Rondout.—This company has been incorporated in New York with a capital stock of $500,000 to build a line from Ellenville, N. Y., a point on the New York, Ontario & Western, northeast down the Rondout River, about 25 miles to Kingston. The directors are: Thomas M. Waller, Frederic H. Reed, George N. McKibbin, S. Harrison Wagner and Schuyler C. Carlton, of New York City; Jesse Boynton, of Bristol, R. I.; Martin B. Waller, of Port Jervis, and Charles M. Ludden and William D. Mattocks, of Boston. It is stated that the new incorporation is a revival of the plan to extend the Port Jervis, Monticello & New York from Smithville to Kingston by using the New York, Ontario & Western branch from Huguenot to Ellenville.

Licking Valley.—Twelve miles of this road, from Salt Lick south to Yale, Ky., have been opened for traffic. The road when completed is to extend from Salt Lick to Blackwater, 30 miles. C. H. Eaton, Yale, Ky., is General Manager.

Little Kanawha Valley.—Tracklaying has been completed for 16 miles from Parkersburgh, W. Va., and construction trains are running on the second section. The grading forces have crossed the Wood County line and are working well along toward Elizabeth, which they will reach within two weeks. The road is projected to extend from Parkersburgh southwest along the Little Kanawha River Valley to Sutton, a point on the West Virginia & Pittsburgh. (See this column for Oct. 22.) James Pettigrew, Parkersburgh, is Chief Engineer.

Missouri & Iowa Southern.—The Sedalia Construction & Equipment Co. has been incorporated in Missouri to build this road (see this column for Oct. 29). The incorporators are: J. E. House, Omaha, Neb.; James

Humphrey and S. C. Gold, of Sedalia, Mo., all of whom are directors of the Missouri & Iowa Southern.

Missouri Pacific.—It is announced that engineers are surveying for a connecting line from Little Rock, Ark., west to Greenwood, the terminus of the Fort Smith Branch, about 165 miles. This road has been under consideration for some time.

New Roads.—Surveyors are at work in Sullivan County, Pa., laying out a route for a new railroad to run from Scranton west to Williamsport. The line crosses the Susquehanna River at a point above Eatonville, and follows the river up to Mehoopany, then up the Mehoopany Creek and across Dutch Mountain.

The Concord, N. H., City Council has instructed the City Engineer to make a preliminary survey for a spur from the line of the Boston & Maine to the granite quarries on Rattlesnake Hill, and to report as to the practicability and the probable cost of building.

It is reported that a charter has been obtained and contractors are looking over the route for a new road in Fayette County, Pa., from Sprinfield through High House to Masontown. The contractors are: Robert Talbert, James Bennett and Oliver O'Hara, of Greensburg, Pa.

The Redwood & Railroad Co., of California, was incorporated in California Nov. 4 with a capital of $2,500,000 to build mills and railroads adjacent to its property in Humboldt County, Cal. The incorporators are: John McCraken, John R. Foster, R. L. Durham, Charles F. Beebe, Philip Metschan and W. S. Mason.

Norfolk, Virginia Beach & Southern.—It is reported that work has been begun on the branch from Kempsville, Va., southeast about 20 miles to Currituck Sound. Alfred Skitt, 3 Beaver street, New York City, is President.

Ohio River & Lake Erie.—This company, whose reincorporation was noted in this column last week, will not make the proposed extensions to the Ohio River and Lake Erie at once, but is ready to make contracts for equipment and for three small iron bridges. H. D. Emerson, Alliance, O., is Vice-President and Superintendent.

Oregon Short Line.—The grading of the Y which is being built at Lehi Junction, Utah, referred to in this column Nov. 5, is to be completed this week. It is to form a connection between the main line on the Ogden & Frisco and a branch line between Lehi Junction and the mining districts near Eureka, and will facilitate the handling of trains, enabling them to run directly through from Eureka to Salt Lake without turning.

Paragould Southeastern.—According to report grading has been completed for the extension of this road from its present terminus at Cardwell, Mo., east 10½ miles to Hornersville. J. E. Daugherty, Paragould, Ark., is Chief Engineer.

Pittsburgh, Johnstown, Ebensburg & Eastern.—Surveys are being made for this road, whose incorporation was noted in this column Sept. 17. It is projected to extend from Johnstown, Pa., on the Baltimore & Ohio, east about 60 miles through Ebensburg to Phillipsburg on the Beech Creek. Samuel P. Langdon, of Philadelphia, is President.

Plymouth County.—Surveys have been completed, right of way has been condemned and all is ready to begin building as soon as bonds have been sold. The work will be easy, there being little rock and no ledges. The highest grade is a little less than 70 ft. to the mile. There will be two pile bridges over a river, 17 highway crossings, two or three of steel and the rest of wood. The road is projected to extend from East Weymouth, Mass., on the South Shore Branch of the Old Colony, southeast about 25 miles through Hingham, Norwell, Marshfield and Pembroke to Hanover. The names of the officers are given in another column.

Richmond, Petersburg & Carolina.—Twenty miles have been graded from the Petersburg end of this line and 18 miles from the southern end. It is intended to begin tracklaying next month and arrangements are being made to buy the rails. The road as projected is to run from Ridgeway, N. C., north 106 miles to Richmond, and it is expected that it will be completed by Aug. 1 next year. (See this column for Oct. 8.) Gen. James S. Negley, 136 Liberty street, New York, is Vice-President and General Manager.

St. Louis & San Francisco.—The citizens of Guthrie, Okla., have voted a cash bonus of $50,000 for the extension of this road from Sapulpa, I. T., west about 75 miles to Guthrie, and it is reported that the company is taking measures for an early building of the road.

Santa Fe & Grand Canyon.—It is reported that surveyors are locating this line, which is to extend from Williams, Ariz., north 72 miles to the Grand Cañon of Colorado. W. M. O'Neil, of Prescott, Ariz., is General Manager.

Sierra (Cal.).—The section of this road from Oakdale to Jamestown, Cal., 41 miles (see this column for Oct. 15), was formally opened for business last week. The line as projected is to extend from Oakdale, on the Southern Pacific, northeast to Sonora and thence northwest to Angel's Camp. W. S. Bullock, San Francisco, is General Manager.

Staceyville.—This road, extending from Staceyville, Ia., west about eight miles to Mona, on the Illinois Central (see this column for Sept. 17), has been completed, and the event was celebrated Nov. 8. W. J. Knight, of Staceyville, is President.

Toledo & Northwestern.—About 600 men and 400 horses are at work on this new road from Albion north about 25 miles to Charlotte. (See this column for Oct. 29.) It is stated that 12 miles have been graded and the work is being pushed at a rate of half a mile a day. Gilson E. Murdock, of Albion, Mich., is among those interested.

Waco & Sabine Pass.—It is reported that surveys have been completed for this road, which is projected to run from Waco, Tex., southeast to Sabine Pass, about 240 miles. R. P. Duncan, Waco, Tex., is Vice-President and General Manager.

Washington, Westminster & Gettysburg.—The incorporation of the Pennsylvania end of this line, referred to in this column Oct. 29, was completed on Nov. 13, and contracts have been let for building the entire line, which is to extend from Gettysburg, Pa., south about 75 miles through Littlestown, Pa., and Westminster, Md., to Washington, D. C. It has been decided to operate the road by steam and not by electricity as at one time proposed. James B. Colgrove, of Washington, D. C., is President.

Wisconsin & Michigan.—This company has begun to relay about two miles of track between Fisher and Kells in Michigan with 70-lb. rails.

Wiscoasia Southern.—This company was incorporated in Wisconsin, Nov. 9, with a capital stock of $25,000, to build a road from a point on the Mississippi River at or near Cassville, Wis., on the Chicago, Burlington & Quincy, northeast 118 miles through Bloomington to Madison. The incorporators are A. C. Tubbs, Grant Ballentine, D. F. Brown, A. J. Frazier, Lincoln Abrahams, H. E. Taylor, M. F. Woodhouse, A. N. Hoskins and W. H. Glazier.

Electric Railroad Construction.

Ashland, Pa.—It is stated that the right of way has been secured by a newly organized passenger railroad company to build a line between Ashland and Centralia. At the former place it is to connect with the Ashland Traction Company's road and at Centralia with the line of the Shamokin-Mt. Carmel Co.

Baltimore.—The line of the Baltimore & Northern Electric Railway Co. to Pikesville has been completed, and cars from Baltimore to Emery Grove, a distance of about 20 miles, were placed in regular service on Nov. 6. The road to Mt. Washington has been in operation for some time, and the cars have been running on a 10 minute schedule. A 20-minute schedule will be carried out from the latter place to Emery Grove. The cars will be heated by electricity.

Belair, Md.—The Havre de Grace & Belair Electric Railway Co. has made an application for right of way for an electric road between Belair and Aberdeen and Havre de Grace, a distance in all of about 17 miles. The proposed route extends through Fountain Green, Fulford, Churchville and Carson's Run.

Brooklyn.—The Cross County Railroad Co. has filed a certificate of incorporation to build a line to connect Brooklyn with Jamaica and Flushing. The route will be largely over private property, which has already been secured. The length of the line will be 15 miles, and connects the villages of College Point, Whitestone and Flushing with Jamaica and the 26th Ward of Brooklyn. The capital stock is placed at $250,000, and the directors include John B. Robinson, of 111 Fifth avenue, and C. E. Locke, of 32 Liberty street, New York.

The Brooklyn & Jamaica Bay Turnpike Co. has filed a certificate of incorporation and proposes to build between Rockaway Beach and Old Mill Creek in Jamaica. The capital stock is $100,000, and the directors are Joseph McClean, Andrew A. Halsey, Theodore Bernard, Charles H. Kelby, George Kellar, James Crowley, Francis Bacon, James Erwin and Charles Brandon, of Brooklyn.

Chatham, Ont.—The Chatham City & Suburban Railway Co. is seeking amendments to its charter to enable the road to extend the line northwest of the city through the township of Dover, to Mitchell's Bay, Wallaceburgh and Petrolea, also to build a road from Rondeau to Charing Cross and thence to Tilbury. F. A. W. Ireland is solicitor for the company.

Chicago.—A permit was issued Nov. 11 by the Commissioner of Public Works to the North Chicago Street Railroad Co. to change the motive power on the Evanston avenue line, between Clark and Halsted streets, to electricity. The City Electrician and the Engineer of the road have agreed on plans for constructing the trolley line. The work will be supervised by the city officials and the rails will be bonded with copper wire. Work will be commenced at once, and the company expects to have the cars in operation before January next.

Doylestown, Pa.—Thomas F. Deegan, room 540, Drexel Building, Philadelphia, is the contractor who is building the Doylestown-Willow Grove road, previously referred to among our notes.

Fort Worth, Tex.—Mr. J. T. Voss, President of the Glenwood & Polytechnic Street Railway Co., writes as follows: "We are now asking the City Council for a franchise over several streets on the south side in this city to extend this line, which in the future will be known as the Belt Line. The length of this connection will be 2¼ miles long, which will require about five more cars to be put in operation. We already have these cars on hand, but will probably be in the market for several new motors."

Haddenfield, Pa.—The Camden & Suburban Rail way Co. has been practically completed and will be opened for service in about two weeks.

Hamilton, Ont.—A company has been organized under President Myles, of the Hamilton, Grimsby & Beamsville, with a capital of $200,000, to extend the line from Beamsville to St. Catherines, a distance of 12 miles.

Hellertown, Pa.—The tracks of the South Bethlehem & Hellertown Traction Co. have been completed and the stringing of the overhead wires will begin at once. The road will probably be in operation next week.

Hoosick Falls, N. Y.—Mr. C. B. Storey, of Hoosick Falls, writes us that he has the contract for building 11½ miles of single track of the Bennington & Hoosick Valley Railway Co., which will connect with the Hoosick Railway Co., and will consolidate this latter road. The power will be obtained from the Hoosick Falls Water, Power & Light Co. Sixty pound T rails will be used throughout and 14 cars will comprise the rolling stock. It is expected that the road will be in operation by Dec. 15.

Marcellus, N. Y.—The consents of the property owners along the line of the proposed electric railway which is to run from Marcellus to Marcellus station, along the Auburn Road, has been filed at the County Clerk's office. The proposed road is to be three miles in length and to be built by the Marcellus Electric Railroad Co.

Parkersburg, W. Va.—The Marietta & Parkersburg Traction Co., which was granted a charter by the Secretary of State of West Virginia week before last, to build an electric road from Marietta to Parkersburg, W. Va., has secured a part of the right of way between Parkersburg and Williamstown, W. Va., and it will be ready to begin work as soon as the bridge over the Ohio is ready. The incorporators are A. McCash, Parkersburg, W. Va.; E. E. Wickson, Parkersburg; A. J. Yoke, Grafton, W. Va.; S. S. Stone, Vienna, W. Va., and W. W. Reynolds, of Oil City, Pa.

On Thursday last, the City Council granted a 50-year franchise to the Parkersburg Electric and Railway Co. over the streets of the city for an electric railroad. The franchise provides that the ordinance accompanying it must be accepted by the company within 10 days, construction work must begin within 30 days, and the road must be completed for 10 miles within 13 months. The company securing the franchise includes J. M. Jackson, Jr., C. H. Shattuck, John Busch, C. C. Martin, H. H. Moss, W. W. Van Winkle and others, of Parkersburg. Negotiations are being made between the new company and the Park City Horse Car Co. for the absorption of the latter.

Philadelphia.—An ordinance has been issued authorizing the Thirteenth and Fifteenth Streets Passenger Railway Co., the Philadelphia Traction Co. and the Union Traction Co., to extend their tracks south of Thirteenth and Fifteenth streets from Jackson street.

Pontiac, Mich.—Mr. J. E. Sawyer, of Pontiac, writes as follows: "Judge George E. Taylor, Congressman S. W. Smith and myself have obtained franchises from this city and all the towns and villages between here and Flint, 42 miles. We are now making survey and expect to commence construction in the spring. Our franchises require us to have the road completed by Nov. 1, 1899. We run through a fine agricultural district where there is no competition, and expect in addition to the passenger traffic to do a profitable light freight business. From here to Clarkston we run through a lake district where there are already numerous summer resorts, which the road will build up. There is now an electric road in operation from here to Detroit, and franchises have been obtained for another road, which is likely to be built next summer, which will give us excellent connection with Detroit."

Rockford, Ill.—The right of way for the Rock River Electric Railway Co., which proposes to build from Rockford to Dixon, is being secured. Mr. James S. Ticknor of Rockford has disposed of his interests in the franchise, and it is stated that General Farson, of Chicago, and Congressman Aiken, of Flint, Mich., are among the backers.

Sidney, N. Y.—The Delaware Terminal Railroad Company was incorporated with the Secretary of State on Nov. 9, with a capital stock of $150,000, to build an electric road from the village of Sidney to the village of Franklin, in Delaware County, a distance of 14⅓ miles. The Directors are Charles L. Burgess, Siegmund T. Meyer, David S. Meyer, John Nef and H. S. Meyer, of New York City; Louis F. Raymond, of Franklin, and Edmund R. Halsey, of Newark, N. J.

Smith's Falls, Ont.—Application will be made to the Ontario legislature for the incorporation of the Smith's Falls, Rideau & Southern Electric Railway Co., with permission to operate electric railroads within the counties of Lanark, Leeds and Greenville.

Waynesboro, Pa.—Arrangements are being completed for a charter for the Blue Ridge Electric Street Railway Co., and it is probable that work will be pushed in the Spring.

Wheeling, W. Va.—The City Council, in August last, granted to the Wheeling & Elm Grove Railroad Co. an extension of franchise and the right to use additional streets in the city, on condition that it change its motive power from steam to electricity, and make the fare over the entire 10 miles of its suburban line 5 cents, instead of a graduated fare ranging from 5 cents to 25 cents. The franchise was accepted and the work of changing the road and building the additional track was begun, and the road will be ready for operation with electric power by the first of the year. The company now has 15 miles of standard-gage track, laid with 105-lb. flat chair rails, and has its electrical plant well under way. The cars have not been contracted for, but the design has been accepted. They will be 45 ft. long and 1 ft. wider the standard electric cars, with an appliance for doubling the power on grades, applying the extra power only when needed. A plan is under consideration to run a chair car on each suburban train, where those who travel a considerable distance may secure individual seats and parlor car accommodations for an extra charge. For additional facts see issue of June 25 last, page 469.

Wilkes Barre, Pa.—The Wyoming & Pond Creek Railway Co., with a capital of $60,000, was granted a charter at Harrisburg, Nov. 9, to build an electric line from Sandy Run Junction to White Haven, a distance of six miles. The directors are: A. J. Lathrop, President; S. J. Lathrop, Pittston; D. O. McCollum, A. M. Freas, Wilkes-Barre; C. L. Hoover, Sandy Run; L. L. Rogers, M. G. Lathrop, L. C. Bacon, New York.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—Negotiations are now pending between this company and the Chicago, Rock Island & Pacific for the use of a joint track by both companies, between Atchison, Kan., and St. Joseph, Mo., about 21 miles. Each company now operates its own line between these points.

Baltimore & Ohio.—Receivers Cowen and Murray have filed in the United States Circuit Court a statement of receipts and disbursements for August, as follows:

Receipts.

Balance Aug. 1	$399,808
Miscellaneous receipts	198,215
Traffic receipts	3,029,362
Total	$3,627,385

Disbursements.

Miscellaneous	$2,595,862	
Traffic	537,240	
Total		$3,133,102
Balance Aug. 31		$494,283

Receivers' certificates.

Balance, series No. 1, Aug. 31	$24,685
Expended during month	7,102
Balance Aug. 31	$17,583
Balance, series No. 2 (Maryland Construction Co.), Aug. 1	$110,828
Expended during month	4,200
Balance Aug. 31	$106,628
Balance, series No. 3 (Pittsburgh & Connellsville), Aug. 1	$519,369
Expended during month	22,661
Balance Aug. 31	$496,708

Terminal Improvement Fund.

Balance Aug. 1	$371,545
Expended during month	9,482
Balance Aug. 31	$362,063

Bennington & Rutland.—This company has issued $500,000 of new 4½ per cent. bonds payable Nov. 1, 1927, to replace $475,000 of old seven per cent. bonds which became due Nov. 1.

Chicago & Southeastern (Ind.).—Judge Higgins, at Lebanon, Ind., has appointed W. O. Darnell receiver of this road upon the request of John Morrison, S. R. Artman, John Dooley, W. T. Straton and Waugh & Shahan, who hold claims against the road. The road extends from Anderson, Ind., to Waveland Junction, 81 miles, with a branch of 18 miles from Sand Creek to Brazil.

Cleveland, Cincinnati, Chicago & St. Louis.—The

earnings for September and for the three months ended Sept. 30 were reported as follows:

	1897.	1896.	Inc. or Dec.
September:			
Gross earn	$1,239,095	$1,123,256	I. $115,839
Oper. expen. and taxes	947,926	831,685	I. 116,241
Net earn	$291,169	$291,571	D. $402
Interest and rentals	245,758	238,792	I. 6,966
Surplus	$45,411	$52,779	D. $7,368
Three months:			
Gross earn	$3,588,762	$3,312,379	I. $276,392
Oper expen. and taxes	2,747,557	2,482,752	I. 264,805
Net earn	$841,205	$829 618	I. $11,587
Interest and rentals	724,558	703,510	I. 21,048
Surplus	$116,647	$126,108	D. $9,461

Columbus, Hocking Valley & Toledo.—Holders of car trust series A are notified that nine bonds have been drawn for redemption on Jan. 1, 1898, at the office of the Central Trust Co., of New York, to be redeemed at par with accrued interest.

Illinois Central.—The earnings for the three months ended Sept. 30 were as follows:

Three months:	1897.	1896.	Inc.
Miles oper	3 725	3,130	595
Gross earn	$6 505 958	$5,199,541	$1,306 417
Oper. expen	4,779 739	3,868,835	910,904
Net earn	$1,726 219	$1,330,706	$395.513

The gross receipts for October are estimated at $2,353,008, against $2,243,620 for 1896, a gain of $109,388.

Lake Shore & Michigan Southern.—Holders of Buffalo & Erie seven per cent. bonds maturing April, 1, 1898, are notified that Speyer & Co. are prepared until further notice to purchase them at par with accrued interest to date of maturity less three per cent. discount.

Lehigh Valley.—Notice is given to holders of six per cent. consolidated mortgage bonds class A that in accordance with the provisions of those bonds there have been drawn 310 of them, amounting to $310,000, which will be paid either at the office of the company at Philadelphia or at J. S. Morgan & Co.'s office, London, Dec. 1 next and that interest thereon will cease after that date.

Louisville & St. Louis.—This road is to be sold at master's sale in Mt. Vernon, Ill., Dec. 14, the upset price being $75,000. This is a portion of the Jacksonville & St. Louis and runs from Centralia, Ill., to Drivers, 16.4 miles.

Manhattan Railway.—The earnings for the quarter ended Sept. 30 were reported as follows:

Three months:	1897.	1896.	Inc. or Dec.
Gross earn	$2,217,942	$2,137.100	I. $80,842
Oper. expen	1,214,351	1,218 920	D. 4,569
Net earn	$1,003,591	$918,180	I. $85,411
Other income	164,385	134,237	I. 30,148
Total net	$1,167,976	$1,052,417	I. $115,559
Charges	783,791	785,585	D. 1,794
	$384,185	$266.832	I. $117,353

Missouri, Kansas & Texas.—The gross earnings for the quarter ended Sept. 30, 1897, were $3,042,254; operating expenses, $1,949,633; net earnings, $1,092,621; charges, $856,932; surplus, $235.689. This company has only recently begun the publication of its earnings.

Nashville, Chattanooga & St. Louis.—The earnings for October and for the four months ended Oct. 30 were as follows:

October:	1897.	1896.	Inc.
Gross earn	$526,352	$473,641	$52,711
Oper. expen	313,871	274,136	39,735
Net earn	$212,481	$199,505	$12,976
Charges	130,566	124,981	5,585
Surplus	$81,915	$74,524	$7,391
Four months:			
Gross earn	$1,984,000	$1,728.351	$255,649
Oper. expen	1.229,902	1,036,177	193,725
Net earn	$754.098	$692,174	$61,924
Charges	513,735	499,924	13,811
Surplus	$240,363	$192,250	$48,113

New York Central & Hudson River.—The earnings for the quarter ended Sept. 30 were as follows:

Quarter:	1897.	1896.	Inc. or Dec.
Gross earn	$12,413,811	$11,269,899	I. $1,143,912
Oper. expen	8,092,475	7,596,768	I. 495,707
Net earn	$4,321,336	$3,673,131	I. $648,205
First charges	2,620,294	2,627,088	D. 6,791
Balance	$1,701,042	$1,046,043	I. $654,999
Dividend	1 000,000	1,000,000	
Surplus	$701,042	$46,043	I. $654,999

New York, Chicago & St. Louis.—The earnings for the quarter and the nine months ended Sept. 30 were reported as follows:

Three months:	1897.	1896.	Inc. or Dec.
Gross earn	$1,547,569	$1,346,005	I. $201,564
Oper. expen	1,179,990	1,030,846	I. 149,146
Net earn	$367,579	$315,159	I. $52,420
Other income	1,223	1,117	I. 106
Total net	$368,802	$316.276	I. $52,526
Charges	303,020	297,491	I. 5,529
Balance	$65,782	$18,785	I. $46,997
Nine months:			
Gross earn	$4,102,806	$4,111,518	D. $8,712
Oper expen	3.276,012	3 353,580	D. 77,568
Net earn	$826,794	$757,928	I. $68 866
Other income	4,526	7,791	D. 3,265
Total net	$831,320	$765,729	I. $65,591
Charges	914,658	888,562	I. 26,096
Balance	(def.) $83,338	(def.) $122,833	D. $39,495

Northern Pacific.—United States Judge Beatty has decided against this company in the claim to several hundred thousand acres of land in the Cœur d'Alene district in Idaho made against about 800 settlers who had settled on these lands under grant from the government. The government grant included every alternate section for 40 miles back from the line of the road, excluding the land held as Indian reservations. The land in question was this excluded Indian land, which is now held to belong to the settlers.

Oregon Improvement.—Judges Gilbert and Bellinger, of the Federal Court at Portland, Or., have passed an order confirming the recent sale of this company's property, as announced last week. At a special meeting of the Board of Directors, held at Portland, the transfer of the property was authorized and the title will be passed Dec. 1.

Pontiac, Oxford & Northern.—The railroad commissioners have ordered a special inspection of this road with a view to compelling the company to repair the roadway or to cease running trains. The road extends from Pontiac to Caseville, Mich., 100.2 miles.

Rumford Falls & Rangeley Lakes.—At a meeting of the stockholders, held Nov. 6, it was voted to issue $400 000 in gold five per cent. 40 year bonds for retiring old bonds of the company and for improvements and equipment.

St. Louis & San Francisco.—The Supreme Court of the United States has decided that this company must pay the interest on the $4,500,000 bonds of the St. Louis, Kansas & Southwestern, the Kansas City & Southwestern, the Kansas Midland and the St. Louis, Salem & Arkansas, which the St. Louis & San Francisco had refused to pay because of changes brought about through the reorganization.

Judge Thomas, at Vinita, I. T., has issued an ordinance appointing Robert L McClure, of Ft. Smith, Ark., Special Master, to sell the Sapulpa Branch of the St. Louis & San Francisco, at a time not fixed. This branch extends from Monett, Mo., southwest 156 miles to Sapulpa, I. T., and the sale is said to be for clearing the title with a view to the extension into Oklahoma, referred to in another column.

Southern.—Holders of Georgia Pacific equipment bonds are notified that 30 of these bonds have been drawn to be paid for from the sinking fund at par with maturing coupons at the office of the Central Trust Co., New York, on and after Feb. 1, 1898.

Union Pacific.—The earnings for September and for the nine months ended Sept. 30 were as follows:

ENTIRE SYSTEM.

	1897.	1896.	Inc.
September:			
Gross earn	$2,098,417	$1,630,918	$467,499
Oper. expen	1,216,370	1,037,000	179,370
Net earn	882,047	$593,918	$288,129
Nine months:			
Gross earn	$13,708.018	$11,696,871	$2,011 147
Oper. expen	8,935,082	7,824,151	1,110,931
Net earn	$4,772,936	$3,872,720	$900,216

UNION PACIFIC PROPER.

September:			
Gross earn	$1,762,233	$1,423,231	$339,002
Oper. expen	1,008.178	861,005	147,173
Net earn	$754,055	$562,226	$191,829
Nine months:			
Gross earn	$11,508,629	$10,149,273	$1,359,356
Oper. expen	7,433,234	6,516,507	916,727
Net earn	$4,075,395	$3,632,766	$442.629

The new dates of the foreclosure sale of the Kansas Pacific (see this column for Oct. 29) are as follows:

Mortgage.	Date of Sale.	Place of Sale.	Upset Price.	Deposit Req'red.
Kans. Pac., Consuls	Dec. 15.	Topeka.	$8,000,000	$500,000
" " Govt. Sub.	" 16.	"	2,500,000	500,000
" " East Div.	" 17.	"	4,500,000	200,000
" " Mid. "	" 18.	Salina.	5,300,000	200,000
Denver Pac. 1st mort.	" 20.	Denver.	2,000,000	500,000

Electric Railroad News.

Brooklyn.—The property of the Coney Island & Gravesend Railway Co. has been leased to the Nassau Electric Railroad Co., of Brooklyn, for 999 years. The latter company is to pay the cost of building, all taxes and assessments, and also the sum of $150,000 in cash, with five per cent. interest, within the next five years or at the expiration of that period.

President Frederick Uhlman, of the Brooklyn Elevated Railroad, states that the question of a traffic agreement between the Brooklyn railroads is now under consideration, but that the idea of consolidation has been abandoned. The reorganization of the Brooklyn Elevated will probably be perfected within a few weeks, and Mr. Uhlman states that this road will be bought in at foreclosure sale next month. He further states that 50 new Pullman cars will be purchased which will be fitted with General Electric motors and that the grips and motors will be used on the bridge for the present, no definite action having been taken regarding the adoption of electricity on the entire system.

Buffalo.—The Cross Town Railroad Co. has been granted an extension of time to build its line on Abbott Road, and has been released from building a number of roads which were regarded as unnecessary.

New Britain, Conn.—A number of large passenger cars which have been in use on the steam railroad are being fitted for use on the third-rail track. The bodies of the cars are taken from the trucks and placed on new trucks fitted with electrical appliances. One seat is taken out from each end, and the controller is placed inside the car, while the air pump and much of the apparatus will be on the front platform. With two seats taken out, the coaches will seat 70 people. The heating of these cars will be by electricity from the third rail.

Pottsville, Pa.—Mr. David J. Duncan has been elected to fill the office of General Manager, made vacant by the resignation of Mr. Lewis S. Wright.

Southington, Conn.—L. V. Walkley, who held a controlling interest in the Southington & Plantsville Tramway Co., which operates a line of electric cars between Southington and Plantsville, has transferred his controlling interest to Ralph P. Ives, who has been Manager of the company for the past seven months. The company is capitalized for $20,000 and bonded for a like amount.

Waterville, Me.—The Waterville & Fairfield Light & Railway Co. is being reorganized and the bonds, held by the Waterville Savings Bank, have been turned in by vote of the directors of the bank. As soon as the financial matters have been adjusted it is expected that the road will be put in serviceable condition before winter and that a generating plant will be built as an auxiliary to the present supply.

TRAFFIC.

Traffic Notes.

It is announced that the New York Central will hereafter stop 10 express trains each way daily at the 125th street station, New York City.

The Erie Canal will be closed on Dec. 1, unless navigation is stopped by frost before that time. Lake and rail lines cease receiving westbound freight after Nov. 20.

The *Northwestern Lumberman* reports that during the month of September the Northern Pacific carried eastward from the state of Washington 1,200 cars of shingles and 541 cars of lumber, an increase of nearly 400 cars over the shipments of August.

An Ohio newspaper reports that the 13 railroads doing business in Toledo have notified shippers that car service (demurrage) rules will be enforced to the letter from and after Nov. 18; from which we infer that not only the letter but the spirit of the rules has probably been disregarded of late.

The Southwestern Passenger Committee has been reorganized, or at least the passenger officials have met at St. Louis and adopted a revised agreement and have re-elected Mr Kent Chairman; but the agreement has yet to be ratified by the executive officers of the roads interested, and press dispatches state that the Missouri, Kansas & Texas is sure to stand out, and that, therefore, the whole agreement is likely to fall through.

J. N. Faithorn, J. M. Hannaford and L. F. Day have been appointed arbitrators to settle the dispute over Mexican freight rates. The parties are, on the one hand, the rail and water lines from the central part of the United States to Mexico and, on the other, the all-rail lines The rail and water lines have always claimed a considerable differential. The arbitrators will receive evidence until Dec. 4, and on Dec. 7 will meet in St. Louis to hear oral arguments.

Joint Traffic Association.

The Board of Control of the Joint Traffic Association met last Tuesday. The report of the proceedings which was given to the newspapers says that there is a more uniform observance of the established rates from St. Louis than at the last meeting. Commissioner Goddard, on behalf of the Trunk lines, reported that the committee having the subject of westbound rates in charge had done good work since the September meeting, and had laid the foundation for a still greater improvement in the situation after the close of the year. The committee which had had under consideration the subject of the issuance of [exchange] passes reported in part, and the following resolution was adopted: "Resolved, that no trip passes be issued, except upon application bearing the personally written signature of the President, Vice-President (actively engaged), General Manager, General Superintendent, Traffic Manager, General Freight or General Passenger Agent of the company making such application."

The resignation of Garret A. Hobart, Vice-President of the United States, as one of the arbitrators of the association, to take effect upon the appointment of his successor, was presented, and action thereon was deferred until the next meeting. The subject of the relations of the Lake lines to the parallel rail carriers was presented, with a view to the better understanding of this subject prior to the opening of navigation in 1898, and a committee of five, consisting of John B. Garrett, S. R. Callaway, S. M. Prevost, O. G. Murray and J. D. Layng, was appointed to give it consideration and report to the next meeting of the Board. The question of eastbound rates from Chicago and adjacent junctions was referred to a committee of Chicago presidents.

The recommendation of the Managers in regard to the standards of speed for passenger trains from New York to Chicago and St. Louis (both ways), as affecting fares on fast trains, will not be acted upon by the roads at present. This matter was the subject of a decision by the arbitrators last February, and it is probable that they will soon be asked to reopen the question.

Chicago Traffic Matters.

CHICAGO, Nov. 17, 1897.

A committee consisting of Commissioners Goddard and Tucker, empowered to act for the Joint Traffic lines, has submitted to the Western roads a proposition concerning rates from St. Paul. It is that after deducting the lighterage charge at New York one-third of the residue of the rate shall accrue to the lines west and two-thirds to the lines east of Chicago. The proposal is now before the Western roads, but Chairman Midgely in submitting it to the lines states that there is no need of haste in giving the trunk lines an answer, because by the assistance of the Grand Trunk the Western companies are in a position to promptly compete with the Canadian Pacific (Soo line).

On Dec. 1 several changes are to be made in the form of the interchangeable mileage ticket now in use in Central Passenger Association territory. The condition limiting the [exchange ticket to a specified train has been dispensed with, and signatures will not be required in the presence of the ticket agent. A drummer can send a porter to get his exchange ticket and can begin his journey by any train the same day.

The roads running between St. Paul and Chicago have asked the Atlantic steamship companies to appoint them steamship agents. The move is made to force the steamship companies to cancel similar arrangements with the Soo line.

The directors of the Chicago Board of Trade have sent a petition to the President of the United States asking him to reappoint the Hon. Wm. R. Morrison on the Interstate Commerce Commission.

It has been agreed by the Western roads to run Canadian excursions from and to the same territory as has been done in former years. The dates of sale will be from Dec 6 to 31, inclusive.

The Central Passenger Association lines have renewed their clergymen's ticket bureau agreement for another year.

The car ferry lines across the lake are said to be cutting rates to such an extent that they are hurting the all-rail lines.

Eastbound shipments from Chicago and Chicago junctions to points at and beyond the western termini of the trunk lines for the week ending Nov. 11 amounted to 58,397 tons, as compared with 57,927 tons the preceding week. This statement includes 13,845 tons of grain, 3,049 tons of flour and 14,021 tons of provisions, but not livestock. The following is the statement in detail for the two weeks:

Roads.	Week Ending Nov. 11.		Week Ending Nov. 4.	
	Tons.	p. c.	Tons.	p. c.
Baltimore & Ohio	4,917	8 4	4,314	7.5
C., C., C. & St. Louis	4,411	7.6	4,628	8.0
Erie	9,330	16.	9,106	15.7
Grand Trunk	3,655	6.3	4,572	7 9
L. S. & M. S.	4,965	8.5	4,770	8.2
Michigan Central	5,104	8.7	5,112	8.8
N. Y., Chi. & St. L.	5,756	9.9	6,398	11.1
Pitts., Cin., Chi. & St. Louis	5,808	9.9	5,760	9 9
Pitts., Ft. Wayne & Chicago	10,460	17 9	8,693	15.0
Wabash	3,991	6.8	4,574	7.9
Totals	58,397	100.0	57,927	100.0

Lake shipments last week were 84,954 tons.